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CONFERENCE

ON

NATURAL GAS CONSERVATION

AT THE

INTERIOR DEPARTMENT AUDITORIUM

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WASHINGTON
JANUARY 15, 1920

U.S.

DEPARTMENT OF THE INTERIOR

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ON
NATURAL GAS CONSERVATION
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INTRODUCTION

The Secretary of the Interior, realizing the acuteness of the natural gas situation, called a meeting to consider questions concerning the conservation of natural gas and economies in its use, to be held in Washington at the New Interior Building, January 15, at 11:00 A. M.

Invitations to this meeting were extended in the following letter, which were sent to some three hundred gas companies, municipalities, State officials, public utilities commissions, etc., throughout the United States:

> "The natural gas situation is acute. As there are over 2,400,000 domestic natural gas consumers, the national aspect is obvious. Domestic consumers waste more than 80% of the gas received. The efficiency of most domestic appliances can be trebled so as to make one foot of gas do the work of three.
>
> To consider solutions of this problem, I have called a public conference of Governors, Public Utility Commissioners, State Geologists, home economic experts, natural gas companies, owners and officials, and appliance manufacturers, in the Auditorium of the New Interior Building at F and 18th Streets, Washington, D. C., at 11:00 o'clock, Thursday, January 15. The purpose of this conference is to consider particularly, possible economies in gas utilization and the mutual interests of the public and the gas companies.
>
> It is all-important that the public and the gas companies understand each other, and I, therefore, urge the attendance of yourself and any others that you may wish to bring with you to this conference."

This conference was called to order by the Secretary of the Interior, who then talked to the conference, after which the conference was turned over to Dr. Van. H. Manning, Director of the U. S. Bureau of Mines. There followed talks by Dr. George Otis Smith, Director of the U. S. Geological Survey, Mr. John S. Rilling, Chairman of the Public Utilities Commission of Pennsylvania, and by Dr. Manning. In the afternoon, Mr. Samuel S. Wyer talked to the conference and answered questions. The meeting was then thrown open to discussion and adjourned at 5:30 P. M., after adopting a resolution contained in the transcript of the meeting.

Those attending the conference are listed hereafter.

The following transcript gives the discussions in full. In regard to these discussions, the Bureau of Mines does not take the responsibility for any of the statements made at this conference, other than those made by its official representatives.

I N T R O D U C T I O N

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CONFERENCE ON NATURAL GAS CONSERVATION
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Address by Hon. Franklin K. Lane, Secretary of the Interior.

I am very much gratified to find so many of you here. Your coming evidences what perhaps may be termed a new spirit in this country -- a willingness on the part of all the people interested in a great industry to come together. Here are representatives of the consuming public, representatives of the State governments, of the public utilities commissions, representatives of the pipe lines, and representatives of the producing wells. That is as it should be. There has been too great a holding off of one from the other. When we get together we can understand each other, we can see the problems that the other man has to meet, and seeing his problems we can sympathize with him and undertake to do our part in bringing about the solution of these problems.

During the war we found that we had to lean upon the industries of the country; and the most gratifying feature of the war was the response that was made by those upon whom the Government was compelled to rely for the carrying on of that great enterprise.

Natural gas was one of these things found to be an essential. We have always known that it was a great resource; we have always been conscience stricken because of our own wastefulness; and this conference has been called for the purpose of seeing if it was not possible by all coming together and talking frankly and freely to discover how this resource could be preserved, how it could be saved, how it could be made of greater usefulness to our country.

Those in Europe who speak of the United States as a country from which it is not possible to draw any real inferences as to social and economic conditions always refer to the undeveloped condition of the United States. They say we are rich -- rich beyond any other country in the world; that we have not yet begun to develop our agricultural land; that we have not yet opened up or had revealed the mineral resources of the land; and that we have been so bountifully supplied by the Almighty with things necessary to sustain life and to carry on industry that no inference can properly be made as to the true or ideal condition that should exist among a people with regard to the production or distribution of wealth.

Before we have wasted these resources it is well that we should look about to find how they can be saved. I am not one of those who believe that a thing that has been given to us should be held in reserve for future generations. There is a true and a false conservation. The false conservation is one that looks so far ahead that it does not allow the free development of the initiative and imagination and industry of the present generation. True conservation is one which requires by the coercive conscience of the people themselves who are in the industry, or who are dependent upon it, if possible the saving to the last minute particle of that resource, permitting its use, putting a premium upon use, but condemning every kind of use that does not make for the advantage of society. (Applause.) And your problem is to see how an irreplaceable resource can be best used.

As I have gone through the States where natural gas is, or has been abundant, I have felt a sense of outrage at the manner in which it was burned all day and all night in the street lamps, wastefully used in industries as a fuel, wastefully used in stoves for cooking. I think we can honestly say to ourselves that we have not applied ordinary thrift, or good sense, to the method of using natural gas.

Now, the upshot of a wasteful policy, whether it is in the field or whether it is in the house or the furnace or the industry -- the natural and inevitable result -- is that the strong hand of the law, of the community itself, will come down upon any such industry. And I have thought that it was the province of government always to call attention to this possibility -- to the condition that existed -- in order to forfend the exercise of force -- and what government does it does by force. If we are not wise in time, if we are not appreciative of conditions that need to be remedied and are indifferent to them, sooner or later society, having learned of those conditions, will take to itself the right to be arbitrary; and society -- at least in the United States -- never does things half way.

The difficulty with any kind of governmental control is that it tends to standardize -- it tends to lay down a certain definite fixed rule to which everybody, no matter what their condition, must conform. And this kind of rigidity seems to be fundamental to governmental activity. All the experiments that have been made with government ownership or government operation confirm that statement. There is not an easiness; there is not a regard for individual conditions; we are unwilling to allow any governmental body the right to make an exception. If an exception is made it develops trouble for the governmental body that makes it. And so in self-protection whereever the Government acts it acts along a certain rigid standard, which is a thing that those of common sense and of large experience know is not the thing that makes for fluency, for adaptability, for elasticity -- and those are the things vital to industry.

So I say to you gentlemen, the conference that you are holding today between the public and the Government and the producer -- that conference is one that if successful, if carried on in the right spirit, may lead to the avoiding of infinitely greater troubles which may fall upon you and upon your industry. I do not know what a governmental policy might be with regard to natural gas. It might be that all industry would be denied the use of natural gas and home use alone allowed. You know how facts are gathered. It might be

shown by a statistical study satisfactory to a board that that would be the wise thing to do; and you know what the result upon your industry would be if such a policy were adopted. I do not say this to you with any desire whatever to intimate that this may come about; I am saying it to you because I have great sympathy with the things that you have done, no little knowledge of what you have done, and a very great desire to see that this industry shall regard primarily and supremely the service that it gives.

We have come upon a time in this world -- not alone in the United States-- when the value of all things is to be judged by the service that they render. In the war we found that things were public utilities which no one had ever dared to classify as public utilities. The original public utility case that went before the Supreme Court was one that grew out of conflict regarding a grain warehouse, and that warehouse was only held to be a public utility because of conditions -- because it was seen that there was something which so many people had to use that there must be reasonable rates applied to the storing of grain. That doctrine can be extended indefinitely; it is not well that it should be extended indefinitely; it is not necessary that it should be extended indefinitely. If we have in our minds the constant thought that our right to use anything that comes out of the soil of the United States is dependent upon the service to which that thing is put the doctrine regarding public utilities will not be extended.

And this is a matter in which we must do what we did in the war, and that was in large part to subordinate our own immediate selfishness -- to take the long view of things. Germany was not coming over to the United States at that time; but we looked fifty years ahead and we said, "We will take the long view and see that that kind of aggressive power is curbed so that she can not spread her doctrine of militarism throughout the world and fasten her power upon us." And so we were willing to sacrifice our boys, to sacrifice our time, and sacrifice our money.

The same principle can be applied in your industry and to all industries. We must take the long view and ask ourselves as to each thing that we do what in the long run will make for the benefit of the community a part of which we are and in which we live only by reason of the fact that we are able to do something for that community. I get wages because I do something that is needed, and therefore I am given enough on which to live. You bore into the ground, and you bring out something that you give to mankind, and in return you must be compensated -- compensated not merely for what you have and have done, but compensated in such a way that there will be provocation, stimulation, for others to follow your example and be of equal service to the world. But you must think not of what you get today.

The danger in business, as the danger in public life or in private life, is the danger of cynicism. The man whom we despise is the cynic. We may admire him at the same time for his cleverness, his shrewdness and his cunning, but we despise him because he has not the broad understanding that a man should have who is a trustee -- and everyone of us is a trustee. Cynicism takes the profit today and says, "Let tomorrow take care of itself;" wisdom says, "I am

going to do my best today -- not for myself but for my community -- in the confidence that the community will make a demand for my services longer than today, in the long tomorrows."

We have been wasteful with natural gas -- partly because it was a sort of by-product like the straw in the wheat field. We have been wasteful because we wanted to get rid of it and get the real thing that we were after, the oil; wasteful because we did not appreciate its value. And the spirit of waste has extended to the household, to the woman beside the kitchen range. There ought to be, and must be, a propaganda conducted which will stop this waste at the well and all along the line until it is stopped in the house. The experiments made by Dr. Wyer showed that we are throwing away into the air practically two-thirds of the natural gas that goes into the household. Some of the States are keen upon this proposition because they realize how valuable to them is the preservation for as long a time as possible of this fuel and light supply.

I wrote a report this year upon the text that power was to be the master of the world. We are in an intense industrial period. The probability is that we will be even more intensely competitive in the next fifty years than we have been in the past fifty years. Each nation will be struggling to save for itself all that it can in its resources and to put them to the best possible use. Nations seem to be formed not so much along lines of strategic protection as upon the line of industrial protection. With the airplane it has not become a matter of such necessity that a great river or an ocean or a mountain range should divide countries as it is that the country itself should be self-sufficient -- have coal and iron and water power and oil and fields of grain. Of course we are immeasureably blessed in these regards; but our policy must be one that will keep us in preeminence.

Gentlemen, I leave this proposition with you. I will ask Mr. Manning to take my place and preside over your deliberations, and I do it in the confidence that into your hearts there has come a consciousness of the value of what you are doing for the country and a consciousness that our future depends upon your wise action now. All that we need in this world of industry is enlightened selfishness; but there is so much selfishness that is unenlightened. You want to throw the blue flame upon your policies and see what you can discover that can be remedied, that can be improved.

We have been carrying on in the Osage territory some most interesting experiments as to the conservation -- the saving -- of gas coming from the well, and the saving in transportation. Those facts and figures are to be put into printed form and distributed among you. It ought not to be necessary for us to do more than to show that improvements can be made; and if you meet this situation in the spirit that has gathered you here I do not doubt that you will be able to find a solution for your difficulties. (Applause.)

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Dr. Van. H. Manning: The Interior Department is the home Department of the national Government. It is a fact that when the Interior Department was first created it was called the Home Department. It seems it is eminently proper in calling this conference that we should consider the question of going into the homes of the consumers of natural gas. Through the propaganda issued by the Interior Department, through its various agencies, we have been attacking the problem of conservation from the producing end. Congress has very wisely concentrated in the Interior Department various governmental controls of the natural resources of the country. In fact, there are four Departments, and from the abundance of researches made by two of those branches, which are more or less technologic in character, we feel that in a measure we can be of some help to you, bearing in mind in your discussions today of all these problems that there is not a single plenary power vested in those two agencies -- I mean the Bureau of Mines and the Geological Survey -- to enforce regulations.

It must be borne in mind that States and agencies are calling upon the Bureau of Mines and the Geological Survey to guide them in forming sane and safe regulations in governing some of the industrial concerns.

I want to present to you today a gentleman with whose name you are all familiar. He is the man who troubles you every year for your statistics regarding the natural gas industry, and he will address you on the subject of the gas production of the United States and its importance to the public.

I take pleasure in introducing Dr. George Otis Smith of the United States Geological Survey. (Applause.)

ADDRESS OF DIRECTOR GEORGE OTIS SMITH.

"Seeing is believing" is good Yankee doctrine, whether taught in Maine or Missouri. We are willing to trust our eye sight in most things, but the trouble is that in some things we have a still larger faith in what we don't see. The mining district that already has great bonanzas to its credit is regarded as having the greatest future and too many investors prefer to buy stock in the mine that has paid the largest dividends for the longest period. That is to say, we put the largest valuation on the biggest hole in the ground, we judge of a mine's future by its past without stopping to realize that the ore once mined and turned into cash can never be realized on again.

Possibly, under the surface of our human nature, we think too much as farmers, for the farmer very wisely sizes up a piece of land by what crops it has produced -- what it has done, it can do again. But when we go deeper and dig for treasure the other truth holds -- what a mine has already given to us, it can not give again, -- other ore may be found elsewhere, but never a second crop in the same place.

Such faith in the unseen reaches its maximum in man's search after oil and gas. The spectacular is too often believed to be the normal and the faster the oil flows from the well the more is believed to remain in the unseen reservoir. The Ranger oil field in Texas and the McKeesport gas field in Pennsylvania are the two latest demonstrations that the interior of this globe is not filled with oil and gas, even though some people seemed to think that the first indications proved that. And so strikes and booms come and go, and the average citizen with his eyes dimmed by oil continues to believe the opposite of what he sees; his optimism is incurable.

But in the long run, I think you will agree with me, reason and logic always get the better of the argument, and as I understand Secretary Lane's purpose in calling this conference, it is high time for waste to give place to wise use. America is the world's largest user of natural gas but in our day of puncturing the outer casing of this earth we have doubtless wasted more gas than we have used.

The need of stopping the waste of this purest and most ideal of all fuels is not newly discovered; at the Conference of Governors in 1908 the State Geologist of West Virginia made the strongest appeal to reason, and had ten years earlier appealed to his own State Legislature. Dr. White's minimum estimate of the daily waste was a billion feet, an unappreciated strain upon the nation's wealth because invisible. And in the possession of this great resource the United States stands unique among the nations. Producing about 95 per cent of the natural gas consumed in the world, we stand as natural monopolists in gas, alongside of Russia in platinum, of Germany in potash, and Chile in nitrate.

The statistics of natural gas are full of interest. Two-thirds of the gas used is utilized in industry and one-third in our homes. Among the States, Pennsylvania maintains first place as a consumer through the years, while Ohio, Kansas, West Virginia and Oklahoma have contended for second and third honors. In 1908, Kansas took second place from Ohio but only for a year, Kansas 10 years later standing in sixth place. Oklahoma has come up from seventh place to contend with West Virginia for third place. But let it be noted that as producers both West Virginia and Oklahoma exceed Pennsylvania and Ohio, a fact that emphasizes the interstate commerce in natural gas.

The increase in utilization of natural gas has been both rapid and steady. In 1908 when Dr. White appealed for more general appreciation of its value, -- 21,000 wells were producing 402 billion feet; ten years later 39,000 wells had practically doubled that output. More interesting and significant is the fact that while in the same period, the proportion of two to one between industrial and domestic use had not changed, the number of industrial users had increased about 50 per cent, whereas the number of domestic consumers had considerably more than doubled -- that is, an ever-increasing number of citizens are enjoying the advantage of this best of fuels, while industry's share is being distributed in larger units.

If we knew the consumption of natural gas prior to 1906 when the Survey's records of volume began, there would be food for serious thought. In these 13 years, however, the quantity used approximated 8 1/3 trillion cubic feet, and the present rate is doubtless barely 900 billion feet a year. So however optimistic we may feel as to the cubic capacity of those unseen reservoirs, we are not warranted in expecting anything in the future but a general decline in the current supply of this fuel. Geology and engineering can not find for the use of man what no longer exists. Natural gas is a mine that is largely worked out,-- it has seen its best days -- and future dividends to the nation can not equal those of the past.

Natural gas with its millions of users, is one of the great public utilities. Like the power companies, the gas company deals in service to the public and the quality of that service is logically the measure of the corporation's standing in the community and in the nation. In one of the engineering journals a recent article, in describing a great interstate power system, classified the causes of interrupted service on its lines. While lightning and sleet and high winds, which must be put outside the control of either company or customer, together caused 33 per cent of breakdowns, failure of the customers' apparatus and their carelessness in operation aggregated 35 per cent interruption in service, while the corresponding figure for company failure and carelessness was less than 10 per cent.

This illustration from another field of public service is doubtless in line with experience in the natural gas industry. In the matter of waste today, I am told the customers must be charged with far the greatest amount, and the fact that they have paid for what they wasted will not clear them at the bar of public opinion. It is probably true that the market price of natural gas has been too low to encourage economy in its use. So, quantity and the quality of service rendered the public largely depends upon the consumers, and a large national end may be attained by this conference if the natural gas industry and the public utility commissions work together to educate the general public. Thrift in the use of natural resources, like other economies, needs to begin in the home.

Dr. Manning: We have for the next speaker a gentleman who comes from the great commonwealth of Pennsylvania and, I am told, produced the first gas well in the United States; he is, I believe, one of the biggest producers, and he represents the Public Service Commission of Pennsylvania. I will give you gentlemen who are producers an opportunity to talk and shoot at these public utilities men today.

At the afternoon session we want a full, frank and free discussion of all the problems that confront both sides. I believe when sensible men get together around a table they can come to some common agreement, and the purpose of this Convention is to try to develop some constructive policy, and it is not merely to bring you - here to listen to these speeches and to make resolutions and let them die. I think when we conclude our sessions we will have some sort of machinery at work that will be satisfactory to all concerned.

We are fortunate today in having with us the representatives of public utilities commissions who will talk to you on the relation of the public to the use of natural gas; I have great pleasure in introducing to you Mr. John S. Rilling of the Pennsylvania Public Service Commission.

(Applause.)

ADDRESS OF MR. JOHN S. RILLING.

Mr. Chairman, Ladies and Gentlemen: Secretary Lane, in his very able and admirable address said that the purpose of this conference was to provide for the conservation of a great natural resource, natural gas.

If we desire to further emphasize the purpose of this conference, we think it might be called as the purpose thereof, to provide ways and means to prevent the present generation from robbing future generations of their portion of the natural gas supply.

We are not prepared to discuss this question in the broad sense in which the Chairman has referred to it. We were only asked to appear here, and we will undertake in a brief and cursory manner to present for your consideration a mere suggestion, which we think, if carried out, will work towards the end that we are trying to reach.

In order that we may note the importance of our subject, may we be permitted to make a few preliminary observations calling attention to the profligacy which has characterized the destruction of our natural resources, and in so doing we will limit ourselves to personal knowledge relation to the resources of our native State.

As we all know, Pennsylvania is the greatest Commonwealth in the Union, at least so far as natural resources are concerned. In no other State have the bounties of Nature been so lavishly bestowed. In its every part there was or is to be found natural riches of one kind or another. Let us consider for a moment its condition when we first took possession of its magnificent domain endowed with almost every material resource required to meet the demands of man. Its hills and valleys were covered with primeval forests of great value. With a ruthlessness that can hardly be comprehended, this great asset was wasted. Noble trees that required generations for their growth to fill the wants of coming generations were felled in the mad rush for commercial gain long in advance of the time when needed. As we now pass through our State, we may observe miles upon miles of denuded land from which this valuable resource was improvidently cut. The barren and in many instances fire-swept hills point heavenward and seem to cry aloud as a reproach to us for what was done them. If we today had but a comparatively small part of this great asset so wantonly destroyed, its value could hardly be estimated. The suffering entailed upon coming generations by its loss is beyond our comprehension.

Our fields of coal, both anthracite and bituminous, have yielded a vast wealth and extended their many benefits to the public of many States. While the extent thereof is still great, the extravagant methods in which coal is now being mined will soon hasten the day when so much thereof as can be conveniently and economically produced will be exhausted.

In the western part of our State there existed and was to be had for the taking, such immense quantities of oil that it seemed it never would cease to flow. This too was beset upon with an abnormal greed for gain and was produced to such an extent that it soon became and was for many years a glut upon the market. Its discovery in other parts of the country has met its ever increasing use, but the time will soon be at hand when the greater population with its increasing needs will cry in vain. Its extent is limited and at the present rate of production will soon be exhausted. Other instances might be cited. These are sufficient to indicate with what a wanton disregard of their value our natural resources are rapidly disappearing.

Closely allied with oil is natural gas, generally found in the same regions. Here is a natural resource whose value can hardly be estimated. It is a clean, convenient fuel and not comparable with any other. When first discovered its worth was little appreciated. Of all the great waste that has marked the destruction of our natural resources, that committed in relation to natural gas has been the most profligate. So wanton has been its waste, so marked has been the misuse and foolish production thereof, and with such extravagance has it been taken from mother earth, that its history is but a sad commentary on the intelligence of those responsible therefor.

It is hardly possible to realize that this valuable and convenient fuel, which for generations has been secretly stored in the hidden recesses of the earth, as if in expectation of the coming of the American people, for them to enjoy could have been so foolishly wasted. But a small part thereof is economically consumed. That its supply is fast diminishing is conceded. At last we are only to a very limited degree awakening to what has been and now is being done in connection therewith. Those informed and competent to judge have testified that of the total amount supplied to consumers, over seventy-five per cent is wasted by improper methods and appliances. The waste which marks this unwise and premature production is even greater, so that at both ends the candle burns. As we meet here today there is going on such an unwise production and elimination of this great asset that if persisted in we soon will only be able to recall the fact that such a blessing once existed.

We are glad to note that there has been such an awakening and a public interest created so as to result in the calling of this conference, and the Secretary is to be congratulated in the wise move thus undertaken. If, however, this conference is to be more than a mere rehearsal of a sad tale, some action should be taken and that very promptly, and plans adopted to stay the reckless production and consumption of natural gas as now carried on. There is yet a large supply of this valuable asset, which if promptly and properly conserved will supply a large population for many years. Prompt measures should be adopted and put into execution to stay the hand of further waste before it is too late. Its consumption should only be permitted under a strict enforcement of reasonable rules resulting in its economical use. Those failing to comply with such rules and regulations should be denied its benefit. Like measures should be adopted to stay waste in its improvident and excessive production. The greater part of gas-producing territory is now held by a comparatively few, but whether held in large or small quantities, its production should be restricted to meet the public needs when used in an economical manner and for the purposes for which it is best intended.

In the western part of our State there existed [illegible] acting, about immense quantities of oil that it seemed it never would cease flow. Ohio, too was based upon which an abundant [illegible] was pro- ced to such an extent that it soon became and was for many years [illegible] upon the market. Its discovery in other parts of the country has [illegible] duction now, but the time will soon be at hand when the greater population its increasing needs will cry in vain. Its extent is limited and at the present rate of production will soon be exhausted. Other instances might be cited, those are sufficient to indicate with what a wanton disregard of their value our natural resources are rapidly disappearing.

Closely allied with oil is natural gas, generally found in the same regions. Here is a natural resource whose value can hardly be estimated. It is a clean, convenient fuel and not comparable with any other. When first discovered its worth was little appreciated. Of all the great wastes that marked the destruction of our natural resources, that connected with natural gas has been the most profligate. So wanton has been its waste, so [illegible] upon the ravages and foolish production thereof, and with [illegible] extravagance has it been taken from mother earth, that its history is but a sad commentary on the intelligence of those responsible therefor.

It is hardly possible to realize that this valuable and convenient fuel, [illegible] for generations has been secretly stored in the hidden recesses of the earth [illegible] expectation of the coming of the American people, for them [illegible] could have been so foolishly wasted, but a small part thereof is consumed. That its supply is fast diminishing is conceded. As we are only to a very limited degree awakening to what has been and now being done in connection therewith. Those informed and competent to judge estimated that of the total amount supplied to consumers, over seventy-five per cent is wasted by improper methods and appliances. The waste which [illegible] this [illegible] and premature production is even greater, so that as both ends the candle burns. As we meet here today there is going on such excessive production and elimination of this great asset that if persisted in we soon will only be able to recall the fact that such a blessing once existed.

[illegible] gratified to note that there has been such an awakening and a public interest created so as to result in the calling of this conference, and the Secretary [illegible] is to be congratulated in the wise move thus undertaken. If, however, this conference is to be more than a mere rehearsal of a sad [illegible], some action should be taken and that very promptly, and plans adopted to stay the reckless production and consumption of natural gas as no cal- [illegible]. There is yet a large supply of this valuable asset, which if promptly and properly conserved will supply a large population for many years. [illegible] measures should be adopted and put into execution to stay the hand of further waste before it is too late. Its consumption should only be permitted under a strict enforcement of reasonable rules regulating its economical use. Those failing to comply with such rules and regulations should be denied its benefit. Like measures should be adopted to stay waste in its imprudent and excessive production. The greater part of gas-producing territory is now held by a comparatively few, but whether held in large or small quantities, its production should be restricted to meet the public needs when used in an economical manner and for the purposes for which it is best intended.

One of the most potent causes for its waste and unnecessary and ill-timed production is the result of the unrestricted and unregulated methods employed. The robbing of territory by the sinking of wells by an adjacent holder is a practice that should not be permitted. The fugacious nature of natural gas and its compressed state in the bowels of the earth, renders it easy to drill a well on a small lot adjacent to the large holder and thereby deplete the same, thus compelling such large holder in self defense to drill wells whether needed or not on his own land in order to protect his property. Recently there was discovered near McKeesport, Pennsylvania, a valuable pocket of gas with a high rock pressure. No sooner was it known than a hungry horde of exploiters, with no regard whatever for this valuable resource, but only led on by a desire to serve their selfish purposes by methods that would not bear inspection, appeared upon the scene. Numerous operations were commenced and wells drilled so that in a comparatively short time the pressure had been reduced to a minimum and the supply will soon be gone. And this is but one of the many examples that might be noted. In our State under the Natural Gas Act of 1885 the supply of natural gas is made a public use. This should in like manner be done in every State where found. With this established, the Government in each State, through inherent police power is vested with ample authority to make and enforce reasonable rules and regulations governing the production of natural gas in order to prevent not only the waste thereof but to protect the holdings of the owners. If this were done, it would not be taken from the earth more rapidly than needed and the value of all gas-producing properties would thereby be very materially increased. With every producing well properly registered and no further drilling permitted unless permission were granted by duly constituted, qualified and authorized authority, the production of natural gas in its present ill-advised and wasteful manner would soon be a thing of the past. While it is true that many new fields are discovered through what is called "wildcatting", the suggestions we make need not in any manner interfere with the proper continuance of such a practice.

There is another feature in connection with this valuable production which we desire to mention. The supplying of natural gas for fuel purposes is largely controlled by a few large interests. May we not ask if there has not been in its production and sale to patrons a disposition to unduly and in toc great haste extract it from the earth and dispose of the same without a proper regard for the ultimate result of such a policy? Has there not and is there not at this time too great an effort being made to make a showing in dividends rather than to produce an extended use and conservative rendering of the public service? Would not an economical policy not only conserve the same, but also in the end inure to the permanency of the investment, as well as extend the blessings of this valuable fuel for many years to come? (Applause.)

ADDRESS BY DR. VAN. H. MANNING.

PURPOSE OF THE NATURAL GAS CONFERENCE.

General Discussion of Purpose of Meeting:

I am quite sure that there is no doubt in the minds of any of you gentlemen present, that our natural gas resources in the United States have probably been less appreciated than any other of our mineral resources. As a consequence of this, I am quite sure that it can also be said that this resource has been the most abused.

The Bureau of Mines has in the past devoted considerable time and effort to pointing out the waste in natural gas that is taking place in our gas fields and has attempted to suggest and devise methods to conserve and, if possible, to increase the duration of the life of the fields and prolong the supply. From the results obtained by these investigations and the reports rendered to the general public, it is evident that the importance of such work, and the benefits to be obtained therefrom, have not been realized. The waste of gas still continues not only in the fields but in the transportation and the utilization of the product. From our past experience it would seem that we have been attacking this problem from only one direction, for while we have encouraged the producer to conserve the supply of gas and institute methods that would induce a minimum waste, we have not approached the consumer. It has been shown in a number of investigations that the public is not always sympathetic with the operator and is more concerned with their own interests and have not given due consideration to the problems to be surmounted by the producer.

Our problem, then is mainly to begin at the other end of our industry and endeavor to show the public how it is possible by proper utilization of this valuable resource to ultimately prolong the supply and thus not only serv their own interests but those of the producer as well. It is morally wrong that a commodity such as natural gas should be used extravagantly, especially when it becomes scarce. There is no justification for extravagant use even when there is a bountiful supply, for if this practice is indulged in, the lif of the industry will be unduly shortened. It is quite possible that during th period of peak loads, acute periods could be avoided if the gas were utilized economically and thus conserve the, probably, two-thirds that is ordinarily used non-efficiently. It is wrong in this case, therefore, to ask the produce to install the extra equipment and machinery to take care of demands when an excess of gas is needed, while under ordinary conditions such machinery would stand idle and thus cause the operator a loss on the money invested in such equipment.

In the many gas hearings that have been carried on before governmental agencies and various public utilities commissions, it has been the general feeling among the public that any raise in price should be looked upon with

suspicion, because it was considered as profiteering and that such funds were merely going to add to the wealth of the producer. This is shortsighted policy and should be entirely discouraged. Such extra profits would be placed in the equipment and go toward improving the service, and thus ultimately benefit the consumer more than the producer. It is a rule, to which there is no exception, that no one profits by waste; therefore, our one important problem is to institute educational measures which will tend toward conservation, and I believe that our efforts should include the consumers of natural gas.

Uses of Natural Gas Aside from Ordinary Use, as Light and Fuel:

In speaking of natural gas, we generally think of it only as a source of light and heat. Other uses have recently been devised which will lend still more weight toward the development of this natural resource and add to its importance as one of our national assets. As a fuel in internal-combustio engines, it has shown itself to be very efficient. Its advantage, particularl in producing oil in the fields can well be realized when it is borne in mind that the only cost necessary to utilize it in this respect, consists of transporting it to the engine. It is present in the nature of a by-product and assists in lowering production costs.

Our natural-gas gasoline industry now has assumed great proportions and has done a great deal toward keeping up the supply of gasoline.

Our recent war has also brought out the fact that helium is to be considered as a very important product for use in dirigibles and lighter-than-air machines, and it has been found that some of our natural gases contain this valuable product. The product can be extracted from the natural gas without materially decreasing the value of the original.

Advantages of Natural Gas:

Besides the advantages of natural gas in ordinary uses, other industries have found it of commercial value, and the gas itself has advantages which are not to be considered lightly. In many of our cities the price of natural gas has been below that which has been paid for our artificial gas. However, if we would consider a price of $1 per thousand cubic feet, it would be found that the gas would still be a considerably cheaper fuel than a number of our most common fuels, such as coal, gasoline, electricity, and coal oil.

The heating value of natural gas is at least 50% greater than that of artificial gas, and is often more than 50 per cent greater. It has been prove that the purity of natural gas is an important item for metallurgical work. Absence of sulphur, dust, or even carbon, makes possible the carrying on of work with this gas which could not be done with artificial gas unless it were first purified..

The candle power of natural gas is also considerably greater than that of artificial gas. Even though the flame is non-luminous, mechanical means have been devised -- such as the use of mantles -- whereby the heating value of the gas furnishes the luminescence. As the heating value is higher than th of artificial gas, less fuel is consumed per light burned.

Wastes in the Industry.

I have called attention in a previous paragraph to the wastes in the industry. It would be unfair to cast the blame of waste in the industry upon any particular field, whether in the producing, transporting, or the utilizing of the gas. All have been equally improvident, and the public, or domestic consumer, is usually equally involved. The producing end of the industry has been covered very thoroughly by the Bureau of Mines in several different connections, pointing out specifically the wastes that were carried on and the methods that might be instituted to overcome them. In this part of the industry there have been several features which have added to the difficulties and over which the producer or operator had no control. For instance, an oil operator might go into a field in search of oil and during the course of development work, would encounter gas and because it proved a menace to him in future operations and because there was no particular value to the product, he would not attempt to conserve the supply but would allow it to expend itself into the atmosphere. The gas company, as well as the operator, is equally to blame for such conditions. Instances have been noted where a gas company might have a transportation system near such a well but would not offer the operator any means of relief from his situation. The point is, that they thought they woul eventually get the gas well anyway, for its salvage value, because the oil operator would probably become discouraged and sell out for whatever he might be able to procure, and even though he did not do this, the gas men would be able to lease lands in close proximity to the oil operator and thus, because o the natural characteristics of the gas migrating underground, they would be able to secure the gas supply without paying the oil operator anything for it.

It is not fully realized by many that the risk taken in such an industry is, indeed, considerable. Not only is there the uncertainty of finding a commercial supply when wells are drilled, but there is the impossibility of storing such a supply when found, and also the uncertainty of how long a supply may last; hence, returns on investments are problematical, except in rare cases.

In utilization, we are coming to the point which is of more direct interest to us and for which Secretary Lane has called this conference. I will merely call your attention to the fact that it has seemed apparent, in view of past experience, that improvements in utilization furnish the most vulnerable point for attacking this problem.

Methods of Conserving the Supply in Field Operations:

In view of what has already been said, I think it is quite important to point out just how a gas supply can be conserved and taken care of in such a way as to produce what might be termed a "dependable" supply, so that the producer can be assured of a fair return on the investment, and the public itself can be assured of a supply at all times to meet its needs. A practical demonstration of this point has been given in operations in the Osage Nation in the Oklahoma fields. Here it has been the policy to grant leases covering large areas of land, and in giving these leases it should be particularly emphasized that the royalties and bonuses paid for such leases have been purely voluntary and have been made by the operators on their own initiative.

Through competitive bidding they have learned that a dependable supply of gas can be obtained from such leases and the higher price obtained has not been in the nature of a profit but has been in the nature of establishing this dependable supply of gas by installing adequate equipment which ultimately insures a safe investment. The large areas of land allows the operator to drill wells without the danger of being menaced by offset wells from a neighbor which would assist in ultimately tapping the available supply of gas. A fair price at the well has given the operator proper inducement to submit to such regulations and to install such equipment as would insure an adequate supply to the consume .

Results of Methods Employed in the Osage:

Because of the methods employed for carrying on operations in the Osage Nation, fewer wells have been drilled and, therefore, less capital has been invested in drilling operations which could be invested in other equipment In outside leases competition has necessarily forced the rapid drilling of well causing greater waste, and hence more money has been spent than was actually necessary. There has been a greater ultimate production per well in the Osage than any other gas field. The importance of a dependable supply of gas has become recognized by many operators, so that they are perfectly willing to give more for gas in this field as has been demonstrated many times in prices offere for gas in the Osage and on commercial lands outside the Osage in the same fiel The assurance of a fair return on the investment in the Osage has allowed the operators to go to other fields and buy gas which they would not otherwise be able to handle because they know that if the outside supply should fail they would still have the Osage gas to fall back on. Better equipment can be employed because a definite supply of gas being assured over a definite period of tim they know that the returns will be adequate and they would not in a year or so be incumbered with useless machinery which had not been used long enough to pay interest on the money invested.

Conclusion:

In conclusion, then, I might say that no one in perticular in the industry has been to blame, but there are opportunities for all to improve, and methods of improvement can be instituted which will definitely insure valuable returns to all concerned, as has been shown by the field operations in the Osage Nation. This end of the problem is probably a little easier to handle than the utilization end. Here we have a rather complex system of production problems in one State, transportation systems in another, and utilization problems in still another. Thus it would seem that, aside from educating the general public on conservation methods and showing them wherein they save for the producer they ultimately save for themselves, the various utilities and intracommerce commissions will necessarily have to work hand in hand and devise and work out problems so that there will be an amicable understanding and a fair consideration of the problems of others, in every case.

Cooperation, then, should be our keynote, with specific examples before us on which to build up our general plans. It is, therefore, earnestly hoped that with the information at hand, some method of increasing our ultimate supply by more efficient production, transportation, and utilization, may be consummated.

That the problems we are attempting to solve can not be overestimated, can be emphasized in no better way than by pointing out to you the condition that would confront us provided our supply of natural gas were suddenly taken away. Not only would it be necessary for us to turn to another fuel at a grea er cost, but inasmuch as the utilization of natural gas might be considered a labor-saving device, we would ultimately take away some of the comforts that have been given us by the foundation of this important industry. (Applause.)

Ladies and gentlemen, the meeting will come to a temporary close. We will convene here again at 1:45. In the meantime, I wish you would please secure as you leave the conference room, Mr. Wyer's paper on waste and use of natural gas in the home, which will be distributed.

I might say that at 1;45 we are to show a moving picture which has been dedicated to the Bureau of Mines by the Standard Oil Company. I understand it is very interesting, and after it has been shown we will complete our business organization.

(Recess.)

AFTERNOON SESSION.

Dr. Manning: Ladies and gentlemen, we will now open our meeting to consider the story of natural gas.

I hope those present at this conference who have not signed a slip will do so this afternoon. We want a complete record of those attending this meeting.

During the Fuel Administration a gas engineer, an expert, devoted considerable of his time to the study of the matter of waste of natural gas distributing systems, and utilization. Very recently he was appointed a consulting engineer of the Bureau of Mines in order that we might obtain the valuable information he has; he will be the next speaker and will present this question to you and will answer any questions that you may propound to him.

After this talk is over we will discuss formally such subjects as you may bring up.

I take pleasure in introducing to you Mr. Samuel S. Wyer of Columbus, Ohio, who will now address you.

ADDRESS BY MR. SAMUEL S. WYER.

Mr. President, Ladies and Gentlemen: Few people appreciate the magnitude of the natural gas industry. Of all the gas sold in the United States as a public utility service three-fourths is natural gas. Of all the towns in the United States that have gas at all, in round numbers one-half have natural gas. At the present time the rate of decline of the industry's field resources has been so rapid and the provision for taking care of that depletion has been so inadequate, that based on a personal investigation of over one-half of the natural gas industry in the United States I am sure that at least three-fourths of the natural gas companies in the United States will be insolvent inside of three years if the present rate situation is continued. By present rate situation I mean the practice of selling natural gas at a figure so low as to not place any incentive on saving the gas, but actually putting a premium on waste, because the gas is cheaper than any efficient appliance that can be purchased or used to save it, at the present low prices.

The present average price of manufactured gas in the United States, for a gas having about one-half the value of natural gas, is over $1.00 per 1000 cubic feet. The new rates that have been put in for manufactured gas average over $1.25 per cubic foot.

For the eastern part of the United States, particularly for the fields in West Virginia and Pennsylvania, the heating value of the natural gas is practically twice that of any manufactured gas that can be commercially made and commercially distributed. On that basis and on the basis of what the consumer must have when the consumers go back to manufactured gas, natural gas is worth at least $2.50 per 1000 cubic feet.

The average price of natural gas for domestic service at the present time is slightly in excess of 30 cents. You can, therefore, see the remarkable price relationship and also the very marked difference between the best fuel that has ever been made by Nature -- and the only fuel that has been made by Nature in a refined form ready for instant use by the consumer -- and other fuels; that is, the nearest commercial price of the nearest competing commercial commodity to natural gas is substantially eight times as expensive to the consumer as the natural gas that is sold. As the result of that situation the waste of natural gas in the United States at the present time amounts to over $3,000,000 a day.

The domestic consumer, after getting the gas delivered to his premises by the gas company, wastes more than 80 per cent of the gas received. A very large part of that waste can easily be eliminated. Based on all of the data that we were able to obtain and on the gas conservation of the Fuel Administration, we found that as an average, taking the total amount of gas reduced to possession in the field as 100 per cent -- that is, the gas after it passes the first gate at the well in the field and, of course, excluding the enormous waste in the underground formation and the enormous waste in drilling, but starting with the well when the gas is reduced to possession and taking that as 100 per cent -- that the average for all companies in the United States was that thirty to thirty-five per cent of that gas was lost between the well and the consumer's meter. That is, the gas company delivered somewhere between 65 and 70 per cent of the gas received. That included transportation, distances in many cases of more than 200 miles. The domestic consumer taking tha gas at the domestic meter then proceeds to take that 65 per cent which is delivered to him and very promptly wastes more than 80 per cent of that. So tha of the total percentage in the field that starts to market more than 50 per cent is wasted on the consumers' premises.

The reason for that waste, not only the primary reason, but the dominating reason, is that in the past the gas has been so cheap that the ordinary appliance has paid no attention whatever to efficiency, and that practice has grown until at the present time practically all natural gas is used in low-burner cook stoves and at least 90 per cent of the gas for heating in furnaces is used in the firepot of the ordinary coal furnace.

In order that you may have some idea as to the relative position of th waste, taking this chart and taking the distance from the bottom to the top as 100 per cent, the ordinary natural gas range, or ordinary natural gas cook

manufacturer

[illegible] average [illegible] compressed gas in the United States [illegible] the present value of natural gas [illegible] consumption per [illegible] the gas [illegible] would [illegible] consumption [illegible]

In the eastern part of the United States, particularly [illegible] Pennsylvania, the heating value of the natural gas [illegible] manufactured gas [illegible] worth [illegible] cents per 1000 cubic feet.

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The domestic consumer [illegible] the gas delivered [illegible] wastes more than 90 per cent of the gas [illegible]. A very [illegible] in all of the data [illegible] per cent [illegible] the United States [illegible] thirty-five per cent of the gas [illegible] the United States [illegible] 90 per cent [illegible] of the ordinary [illegible]

[illegible] the domestic [illegible] the [illegible] ordinary [illegible]

In order that [illegible] the natural gas [illegible] from the [illegible] to the [illegible] ordinary [illegible] stove, using the gas at high pressure utilizes about 13 per cent of the heat energy in that gas. Taking that same gas and in the same stove and merely raising the burner and properly directing the then short flames so as to curtail the waste from the flame and get the heat into the vessel will enable you to raise the 13 per cent to about 43 per cent. That is, with the same gas and the same stove, merely a proper adjustment on the stove, you can treble the efficiency of the gas and make one foot of gas do the work of three. Or, to state it in terms of money, one dollar of natural gas used under this condition, that is, with low pressure and properly directed short flames, will cost the consumer no more for cooking than 33-cent gas used in the ordinary stove in the ordinary way and with the ordinary high pressure.

These data are based on experimental results in the Department of Home Economics, Ohio State University, and were obtained in our routine cooking operations. In addition to showing difference of efficiency they demonstrate another very important feature, namely, that during the low pressure period, which is inevitable with the natural gas company handling a large heating business in cold weather, if the consumer will properly use the gas that is received, usable service can be obtained at very low pressure.

The pencil that I am holding in my hand represents the length of the flame on the ordinary natural gas stove. The rubber on the pencil represents the tip or effective part of the flame. With the ordinary vessel position, namely, on top, the heat from the tip of the flame can, of course, get into the vessel. However, under low-pressure conditions that flame which was 2¾ inches long, may drop down to be less than one-half inch long. If you still have that flame in its old position and the vessel 2 or 2½ inches above you can easily see the difficulty in attempting to cook on the old ordinary burner natural gas stove. If, now, you will do one of two things, either raise the burner or lower the vessel so that this short flame can get at the vessel, you can get usable service with the normal time and with practically the normal gas consumption. At the same time you will not be making an additional drain on the other consumers. For instance, taking the condition that we have represented here where normally we get only 13 per cent of the heat energy out of the gas and attempt to use a stove adjusted to that situation with low pressure, the meter is running, it is registering the amount of gas going through, and with this short flame very often the housewife may be trying for an hour or more to bring a kettle of water to boil and be unable to do it. At the same time she has been using the gas, and because of her misuse of the gas, has deprived somebody else of that many cubic feet of gas, which, if the gas had been properly used, would have given usable service.

The next diagram shows the difference between using the gas in the firepot of an ordinary coal furnace and using the gas in the firepot of a correctly built natural gas furnace. In the first diagram here the total distance from the bottom to the top taken as 100 per cent represents the heat energy of the gas. Burning the natural gas in the firepot of the ordinary furnace will give an efficiency of about 25 per cent and a loss of about 75 per cent. Taking this same gas and burning it in a correctly designed and built natural gas furnace, where you have a long fire travel and a large amount of radiating surface, you can increase the efficiency from 25 per cent up to 75 per cent and decrease the loss from 75 per cent down to 25 per cent.

In other words, with proper utilization in the gas furnace you can make one foot of gas do the work of three, or, stated in terms of price -- and price is ultimately what is going to determine the range and magnitude of the whole gas conservation -- $1.00 natural gas properly used in a correctly built natural gas furnace will cost the consumer no more that 33-cent gas used in the firepot of the ordinary coal furnace.

With regard to the magnitude of the waste problem, as there are over 2,400,000 domestic natural gas consumers in the United States, and it is a safe statement that more than 2,000,000 of those are using cooking stoves that have low burners and, therefore, do not get very much more, if any, than 13 per cent of the heat energy in the gas out of the gas, and that at least 90 per cent of the large heating installations are where the gas is burned in the firepot of an ordinary coal furnace wasting 75 per cent of the gas or using three times as much gas as is necessary, you can easily see the possibilities of very greatly prolonging the life of natural gas and increasing, therefore, the period during which it will be useful.

To state it this way: If natural gas is made worth saving, you can add from 15 to 20 years to the possible natural gas life. That, of course, is of great importance to the larger towns, because when the natural gas is gone those towns will have to go back to manufactured gas which will cost them very much more than any price that has ever been paid for natural gas. The majority of small towns enroute along the main transmission lines will be without gas entirely. Therefore, the matter of extending the period where natural gas will be used or can be used is one in which the public has a most vital interest.

A great deal has been said about the enormous waste in the fields and that the field waste ought to be corrected, before you correct the waste on the consumers' premises. In the first place, the sonsumers' waste is very much more on his own premises than is wasted in the entire distance between the field and his premises. Secondly, it is possible to get very much quicker results by having the consumer put in efficient appliances and making the necessary changes, and all of those changes must be made when the consumer goes back to manufactured gas; and, third, the only way that you will ever eliminate the enormous field wastes is to make natural gas worth saving. The only way that you can make natural gas worth saving and get by with it with the public is to show the public how by curtailing on the waste in the average home they can get the same service, even at a very much higher rate, without an additional cash outlay per annum.

To make a concrete illustration of that, at the present time in the State of West Virginia the carbon-black industry in that State wastes 50 per cent more gas than is used by all of the domestic consumers in that State. And by waste I mean misuses of the finest fuel that has ever been made by Nature, through merely converting that fuel into lampblack.

The Public Utility Commissions of the States of West Virginia and Pennsylvania and the Public Utility Commission of the State of Ohio and the Public Councils in Ohio have it in their power to shut down 90 per cent of the carbon-black plants of West Virginia within ninety days. The only way that they ever will be shut down is by making that gas worth saving. Just as soon as the gas at the consumers' end is made worth saving by an increase [illegible] proportionately [illegible] the gas furnace and [illegible] put in the [illegible] heated in terms of [illegible] is [illegible] of the [illegible] construction [illegible] gas properly used in a correctly built [illegible] no more than [illegible] gas used in the ordinary coal furnace.

With regard to the [illegible] of the waste [illegible], as shown [illegible] domestic natural gas consumers in the [illegible] statement that [illegible] of them are using [illegible] stoves [illegible] have [illegible] heaters and, therefore, do not get very much [illegible] of the [illegible] out of the heat [illegible] gas out of the [illegible] of [illegible] large [illegible] installations are [illegible] of an ordinary coal furnace wasting [illegible] of the gas or [illegible] times as much gas as necessary, you can easily see the possibil- [illegible] greatly prolonging the life of natural gas and increasing the [illegible] period during which it will be useful.

It is true that [illegible] natural gas is made [illegible] from 15 to 20 years [illegible] natural gas [illegible] of great importance to the [illegible] because [illegible] the natural gas [illegible] large [illegible] have to [illegible] manufactured gas which will cost [illegible] much more than any [illegible] that has ever been paid for natural gas. The [illegible] of small towns [illegible] along the main transmission lines will be with- [illegible] entirely. Therefore the matter of extending the period where natu- [illegible] will be used or can be used is one in which the public has a most vital interest.

A great deal has been said about the enormous waste in the fields and [illegible] field waste ought to be corrected, before [illegible] the waste on [illegible] consumers' premises. In the first place, the consumer [illegible] of his own premises than is wasted in the natural gas fields between [illegible] and [illegible]. Secondly, it is possible to get more than [illegible] by taking the consumer [illegible] to efficient appliances, and making the waste [illegible] and all of these [illegible] must be [illegible] by the consumer [illegible] manufactured gas, and [illegible] the only way that [illegible] field [illegible] natural gas [illegible] is to give the public [illegible] by [illegible] on the waste in the average home [illegible] get the same [illegible] from [illegible] a very much higher rate, without an [illegible] additional [illegible] per annum.

To [illegible] a concrete illustration of this, at the present time in the State of West Virginia the carbon black industry in that State wastes [illegible] more gas than is used by all of the domestic consumers in that State [illegible] the most [illegible] of [illegible] fuel that has ever been [illegible] through [illegible] converting that fuel into lampblack.

The Public Utility Commissions of the States of West Virginia and [illegible] and the Public Utility Commission of the State [illegible] this [illegible] their power to shut [illegible] the carbon black plants of West Virginia [illegible] danger [illegible] they [illegible] will be shut down by [illegible] that was worth saving. That [illegible] at the consumers' end is worth saving by [illegible] in price, the field level price will immediately be increased. Just as soon as the man who is now wasting this enormous quantity of gas in the manufacture of lamp-black can make more money by diverting that gas into public utility lines, he will shut down his carbon-black plant, and the public utilities can purchase this residue supply of gas. Furthermore, as natural gas supplies become exhausted it is, of course, necessary to use compressing stations to supplement the rapidly declining rock pressure. If the gas price level in the field is high enough there is almost no limit to the amount of compressing station equipment that can be installed. In fact, you can go so far as to actually pump the various wells and get the residue supplies out which are in the sand and which can be taken out only slowly and which will have no reserve capacity for peak loads, but those small supplies could actually be pumped or sucked out of the ground slowly, for many years. Therefore, the whole conservation question simmers down to one fundamental economic principle; make natural gas worth saving and conservation of the gas will take care of itself, and without an adequate price there will never be adequate conservation.

I will now be very glad to answer any questions which any one may put with regard to any phase of the natural gas industry. If I can not answer the question I will frankly tell you so. You may open fire.

Mr. Rupp (of Buffalo): What, if anything, can be done, Mr. Wyer, either by the distributor or by the householder that will tend to make the pressure more constant in the use of gas?

Mr. Wyer: Fluctuation in pressure is due to the marked increase in demand for heating service. That heating service fluctuates almost directly proportionately to the variation of fluctuation of atmospheric temperature. Every gas company carrying a large heating load during the cold weather has a demand very much greater than the available supply; that is, there is not enough gas to go around. All of the consumers attempting to get service at that time, of course, have the cumulative effect of pulling the pressure down. On top of that you have the situation that I referred to here where, because of their improper use of gas at low pressure, they are allowing the gas to pass through the meter and through the stove and burning it but not getting the full value of the gas. In other words, because of improper utilization methods, during the low pressure period the efficiency of the appliance is even lower than it is under normal conditions, thereby making, during an already acute period, a situation that is very much worse due to inefficient utilization.

Now there are just two ways in which you can get around that: In the first place you have to get rid of that marked peak load. There is not enough gas to go around -- and the only way you can get rid of that peak load is either with a limitation as to how the gas shall be used or to make the peak load service (which costs very much more) so expensive that you will drive the consumers who are responsible for that peak load off your line. You see, during the peak load period (and that lasts for only a comparatively very short period -- less than one per cent of the total 100 per cent operating time of the year) the service that those peak consumers use costs very much more than the normal service. Therefore, to be equitable to all consumers I think it is entirely fair and just to the consumers as a whole to have a higher price for that peak load service; that is, a fixed price for a normal consumption that [illegible] period, the field level pressure would immediately be increased. Instead of [illegible] as this gas which is now wasting this enormous quantity of gas in the con[illegible] at present Flint can make more carbon-black [illegible] him to [illegible] shut down his carbon-black plant [illegible] supply in purchase this residue supply of gas. Furthermore, [illegible] supplies [illegible] of course, necessary to keep the pressure [illegible] the [illegible] of the [illegible] in that field [illegible] there is already [illegible] station equipment that can be installed. In [illegible] wells [illegible] which are [illegible] can be taken out [illegible] slowly [illegible] could [illegible] no [illegible] There [illegible] out of the ground slowly for many [illegible] the whole conservation question [illegible] principle [illegible] natural gas [illegible] worth saving and conservation [illegible] take care of itself, and without an adequate price there will never be adequate conservation.

[illegible] will be very glad to answer any questions which anyone may put with regard to any phase of the natural gas industry. If I can not answer the question I will frankly tell you so. You may open fire.

Mr. Yost (Chairman): [illegible]

Mr. [illegible]: What [illegible] anything can be done [illegible] by the distributor or the householder that will tend to make the pressure more constant in the use of gas?

Mr. [illegible]: Fluctuation in pressure is due to the marked increase in demand for heating service. That heating demand fluctuates almost directly in proportion to the variation of fluctuation of atmospheric temperature. Every gas company supplying a large heating load during the cold weather has a demand very much greater than the available supply, that is, there is not enough gas to go around. All of the consumers attempting to get service at that time of course, have the cumulative effect of pulling the pressure down. On top of that you have the situation that I referred to there where, because of their improper use of gas at low pressure, they are allowing the gas to rush through the meter and through the stove and burning up but not getting the full value of the gas. In other words, because of improper utilization methods, during the low pressure period the efficiency of the appliances is much lower than it is under normal conditions, thereby causing, during an already acute period, a situation that is very much worse due to insufficient utilization.

[illegible] Now there are just two ways in which you can get around that. In the first place you have to get rid of that marked peak load. There is not enough gas to go around -- and the only way you can get rid of that peak load is either with a limitation as to how the gas shall be used or to make the peak load service (which costs very much more) so expensive that you will drive the consumers who are responsible for that peak load off your lines. You see, during the peak load period (and that lasts for only a comparatively very short period -- less than one per cent of the total 100 per cent operating time of the year) the service that those peak consumers use costs very much more than the normal service. Therefore, to be equitable to all consumers I think it is entirely fair and just to the consumers as a whole to have a higher price for that peak load service; that is, a fixed price for a normal consumption that would take care of your cooking, running of hot-water tanks, incidental heating such as a bathroom heater or a bedroom heater, and then an increase in price which will penalize the large user and which, if he insists on staying on, will make him pay a price which will be commensurate with the increased cost of the service he is receiving.

Under present conditions with a constantly declining supply of gas it would be impossible, speaking generally, for any natural gas company to take care of the peak load service in the winter time, and with a large number of heating consumers on the line.

Does that answer your question fully?

Mr. Rupp: Yes; thank you.

Mr. White (of West Virginia): There was one point in the speaker's statement that I did not know on what basis his statements were founded, that is, with reference to the waste in the transportation.

Now in the early history of gas transportation the Pittsburgh company laid a line to probably the largest gas well ever struck in West Virginia, and it was currently reported that more gas was put into that line at the West Virginia end -- well, twice as much gas, or more than that -- as was delivered at Pittsburgh. Of course, that was in the early history of the industry when the closing of joints was little understood, when appliances for doing that had not been invented, particularly for large size lines without screw joints. But in modern times my belief was that that had largely been cured, yet Mr. Wyer states that from thirty to thirty-five per cent of the gas that enters these lines from the field is wasted between there and the point of consumption. I would like to ask Mr. Wyer on what data he bases that conclusion, how he secured it, and if it is entirely reliable.

Mr. Wyer: I happen to have the operating figures for rather a large number of main lines and town distributing plants. For instance, in one group of lines and town distributing plants that includes about one hundred distributing plants.

I have been preaching the desirability and the necessity of gas measuring devices for a number of years and finally got that company to put in measuring devices in the field so as to get a definite basis of input into that line, also measuring devices where the gas is measured out into the distributing plants. The first year's operation of that plant showed a loss between the field and the ultimate consumer's meter of in round numbers forty per cent. Within four year's time that same company, following up the matter of inspection, has lowered that total loss down to close to twelve per cent.

Another case where the input to a main line was measured; at one time the loss in about 160 miles of main line and a number of distributing plants was in round numbers 33 per cent. Within 18 months' time that particular property had curtailed that, so that the loss, correcting for Boyle's law deviation, because the gas is measured at very high pressure, is about 11 per cent.

In the distributing plants of the Kansas Natural Gas Company, which, of course, is probably the most glaring case of gas waste in distributing plants in the United States, and using the figures obtained by the United States Bureau of Standards in proving the meters, the loss in those distributing plants amounted to forty-two per cent of the gas received. The main line loss in that particular property at the same time was down to ten per cent. That, of course, is an extreme case as far as distributing plant loss is concerned, and is due to the fact that that property has been in constant litigation since 1912. The first litigation started on an increase of rate from 25 to 27 cents. The gas was so cheap that there was no incentive, especially under a very objectionable percentage contract which actually placed a premium on waste, to effect economies, and the distributing companies did practically nothing to correct that condition.

I had a large number of similar data and it was my best judgment, considering all the facts obtainable, that at the present time the average loss for the entire United States between the point where the gas is reduced to possession and the ultimate consumer's meter, was somewhere between 30 and 35 per cent, some companies running under that and some companies running above

Of course, all of those companies that have measuring devices at the gates of all their towns and into and out of their main lines have the advantage of being able to allocate their leakage and determine where it is located so that corrective methods can be immediately applied.

Does that answer your question? That figure, of course, is an estimate but it is an estimate based on the best known information.

Mr. McDowell: Mr. Wyer might have added one large loss of the companie receiving their gas from the Kansas Natural is that the Kansas Natural itself has no control over the distributing companies.

Mr. Wyer: That is correct.

Mr. McDowell: The figures speak in terms of high and low pressure. Reduced in inches of water pressure, what does that mean?

Mr. Wyer: The ordinary natural gas man has been so long schooled in "four ounces", that it has become sort of a sacred white elephant. Four ounces per square inch would be equivalent to seven inches of water pressure. That would be considered high pressure, much more than twice what would be used in manufactured gas, measuring the gas at the appliances.

Mr. McDowell: Is it not frequently distributed at two and one-half inches?

Mr. Wyer: Yes; Kansas City at the present time is running on low pressure distribution and consequently has reduced the leakage.

Mr. McDowell: There is a great loss in the distributing plants at hig pressure.

Mr. Wyer: Yes; that is quite right.

Mr. McDowell: I simply want to talk about that 35 per cent leakage in main lines.

Mr. Wyer: That is not main lines only.

Mr. McDowell: Well, generally. I have had a good bit to do in West Virginia with two of the largest operating companies there, and I want to say that as regards the leakage there on many of our main lines, carefully measuring both ends, lines 175 miles long, we show more gas delivered than produced. (Laughter).

Mr. Wyer: Then very obviously your measuring device is wrong.

Mr. McDowell: That is a question of the measuring device. We measure in Cincinnati about 15,000,000 feet of gas a day, 15,000,000,000 to 18,000,000,000 a year. Our variations are so slight in the main line 175 miles long it is hardly noticeable.

We have not measured the gas from our field mains into the main lines, but have patrolled those and such a thing as leakage is scarcely known. I venture to say our leakage in West Virginia is scarcely five per cent, and I speak with knowledge.

It is true that when I was connected with the Hogan Natural Gas Company -- and I know they have improved conditions since I was there seven or eight years ago -- but at that time our main lines had practically no leakage at all.

I think as far as the West Virginia field is concerned our leakage is down to the minimum, and I think it is rather unfair to the industry that the report goes out that we are foolish enough business men to lose a third of our gas.

Mr. Wyer: You must remember that there is one large company operating in Ohio that has no definite check.

Mr. McDowell: I don't know. I speak primarily of West Virginia. There is no company there that does not know what they are doing.

Mr. Wyer: I have been around the West Virginia field a good deal, and you will find, while your main line losses are low you have still large losses on your field lines.

Mr. McDowell: I have close contact with our 1000 or 1500 wells and we have practically no leakage there. They are carefully examined.

Mr. Wyer: How do you know you do not have any leakage if you do not have a measuring device?

Mr. McDowell: Of course, you can not accurately follow that; that is true, but it is a fact they are gone over and they are very well protected, and nothing like 35 per cent ---

Mr. Wyer: The figure of per cent which I gave represents the best data we can get as representing the average of the entire United States.

Mr. McDowell: If what you say is true it is no wonder three-fourths of the gas companies are ready for the receiverships. That is a fact because it does not exist with us and does not exist with other big companies in West Virginia.

Mr. Wyer: I will say this for you, that there is not a gas company in the whole industry that has a better future service possibility than your company.

Mr. McDowell: We know that and are trying to protect it.

Mr. McDonald (of Louisville, Kentucky): I want to corroborate what Mr. McDowell says. We have measuring devices at both ends, and during the ye that loss does not exceed two per cent of the gas going into the line. I thi it would be most unfortunate if the idea goes out that in a well managed gas company, as existing today, they allow 35 per cent leakage.

Mr. Wyer: They are not well managed.

Mr. McDonald: How can we ask the public to save in their cooking stoves if we are allowing any such amount to go to waste?

I can not speak for any other line than that one, but I have no reaso to believe that it is any better than the others, but I do have measurements at both ends. Sometimes you have to calibrate those lines very closely to de- termine that there is not more going out at the western end than goes in at the eastern end, but the best information I can get, calibrating the meters against each other, is that that main line, 185 miles long, has about two per cent leakage.

Mr. Wyer: What would be your average discharge pressure?

Mr. McDonald: Generally speaking there would be about 250 pounds at one end and about 150 pounds at the other.

Mr. Wyer: Well, there would not be 150 pounds during the cold weather at your Louisville end.

Mr. McDonald: During extreme cold weather there is generally very little at the Louisville end, due to the fact of excessive consumption for heating.

Mr. Wyer: Are you making any correction there for deviation of natural gas under Boyle's law?

Mr. McDonald: Yes; that is considered by as good mathematicians and with as many slide rules as you could find anywhere, but I am satisfied they get it right. And, further than that, the line is walked and the question of whether the grass over it has died in spots is carefully observed, and you know the vapor in the gas will kill the grass.

Mr. Wyer: Yes, sir.

Mr. McDonald: If [illegible] it is the [illegible] of the gas companies [illegible]. That is a [illegible] what [illegible] that does not exist with other utility companies in [illegible]

Mr. Lyon: I will say this for you, that there is not a gas company in the whole industry that has a better future service possibility than your company.

Mr. McDonald: We know that and are trying to protect it.

Mr. McDonald (of Louisville, Kentucky): I want to corroborate what Mr. McDonald says. We have measuring devices at both ends, and during the year that loss does not exceed two per cent of the gas going into the line. I think it would be most unfortunate if the idea goes out that in a well managed company, as existing today, they allow 25 per cent leakage.

Mr. Lyon: They are not well managed.

Mr. McDonald: How can we ask the public to save in their cooking stoves if we are allowing any such amount to go to waste?

I can not speak for any other line than that one, but I have no reason to believe that it is any better than the others, but I do have measurements at both ends. Sometimes you have to calibrate those lines very closely to be sure that there is not more going out at the western end than goes in at the eastern end, but the best information I can get, calibrating the meters against each other, is that that main line, 180 miles long, has about two per cent leakage.

Mr. Lyon: What would be your average discharge pressure?

Mr. McDonald: Generally speaking there would be about 300 pounds at one end and about 150 pounds at the other.

Mr. Lyon: Then there would not be 150 pounds during the cold weather at your Louisville end.

Mr. McDonald: During extreme cold weather there is generally very little at the Louisville end, due to the fact of excessive consumption for heating.

Mr. Lyon: Are you making any correction there for deviation of natural gas under Boyle's law?

Mr. McDonald: Yes; that is considered by as good mathematicians and [illegible] as you could find anywhere, but I am satisfied they are right. And, further than that, the line is walked and the question of whether the grass over it has died in spots is carefully observed, and you know the vapor in the gas will kill the grass.

Mr. Lyon: Yes, sir.

Mr. McDonald: And I think it is unfortunate to say to the American public that the companies are allowing 35 per cent to go to waste and then asking the public to inconvenience themselves with the extremely small economies that each one can make. As I said, I have no information as to any other line than that one, but that is a pretty long line and its leakage, I think, is exceedingly small.

Mr. Wyer: I will agree with you that on your particular line your statement is correct. I am also sure that you are not correct in stating that you are correct in your final calculations for deviations from Boyle's law. That throws the leakage calculations out several per cent. For instance, on a line out of West Virginia that shows a loss at between the input and output of the line, assuming the gas follows Boyle's law, which it does not, that the loss is 7 per cent; in reality the loss is 11 per cent, so that your loss in reality is slightly larger.

Mr. McDonald: Well, if you take the line and solder it up tight at both ends and leave a gage on it for two or three days, and there is no substantial variation in the temperature under the ground, and the pressure actually does not drop more than one or two pounds from an initial pressure of 300 pounds, in fact, scarcely drops so you can see it has dropped, you eliminate all kinds of mathematical questions and all questions of change of liquids into vapour. Of course, the line is rather a new one, but, as I say, I do not know that it is any better or any worse than other lines. I do not think it is anything like that percentage.

Mr. Wyer: What is the loss in your distributing plant in Louisville? You see, you are not making a fair comparison. My statement was that starting in at the well where gas is reduded to possession, and going clear to the ultimate consumer's meter, the average loss in the United States was somewhere between 30 and 35 per cent.

Now another company produces the gas in West Virginia and carries it over the most dangerous part of the transportation link; that is, the gathering lines in the field to Inez Junction, where it is measured to you. The figure you have given is only for a very small part of the total. It does not include your distributing plant or your field condition.

Do you know what the distributing loss in the Louisville plant is at the present time?

Mr. McDonald: Yes; I do. Of course, the leakage in a town is frequently stated in percentages.

Mr. Wyer: Yes.

Mr. McDonald: Which is the most foolish way you could think of stating

Mr. Wyer: Yes.

Mr. McDonald: Because it is exactly the same when furnishing no gas as when furnishing a good deal of gas. But stating it in per cent, I will say tha it will run from about 3 per cent on a large day's output to about 11 or 12 per cent for a small day's output.

Mr. Wyer: That is a very well maintained plant.

Mr. McDonald: Yes, it is. There is a great deal of care taken to avoid loss.

Mr. Wyer: Assume just for comparison purposes that we take your figures there and allow an average loss on your distributing plant of about 7 per cent. You will concede that is fair?

Mr. McDonald: Yes.

Mr. Wyer: You gave the figure of 3 per cent in your main lines.

Mr. McDonald: I said 2.

Mr. Wyer: We will say 2. Now the deviation from Boyle's law would certainly bring that up to 3, so you have 10 per cent. So you have at least that much between Inez Junction and the main lines into the field, and all of those many gathering lines going out into the individual wells. Now you are connected to an unusually well maintained field system. Therefore, your fiel losses will be way below the average. It is a very common experience to go around in gas fields, just driving along the road, and to hear the gas hiss. That is a matter of common knowledge and common observation. And so, while you have a very well maintained plant, I still maintain that we have adequate information on which to base the other estimate and that a frank facing of th facts just as they are by both the companies and the public is for the best i terest of all, because the only way you can ever curtail that 35 per cent is make the gas worth saving. That is wholly up to the public. If the public wants that 35 per cent loss curtailed it is up to the public to say so.

Mr. McDowell: Our loss is 8 per cent in the city. It is an old artificial gas plant and we spent $1,000,000 on it for repairs.

Mr. Kinkade: There are two or three of us around here who do not understand how you expect the public to save that 35 per cent lost in the pipe lines.

Mr. Wyer: I did not say that the public could save that amount. I stated that the public could curtail that by making the gas worth saving.

Mr. Davis (of Jamestown, New York); Mr. Wyer, I have not heard any remonstrance on the part of these gentlemen who own the gas companies against the proposition to vastly increase their revenues by this proposed increase i price.

Mr. Wyer: Let me answer that here. Trebling the price of natural ga would not only fail to increase the total revenue, but would probably produce a considerably gross revenue.

Mr. Davis: I would like to know upon what facts that is based.

Mr. Wyer: Because just as soon as you increase the price you decreas the consumption.

Mr. Davis: I doubt whether there are any facts which would substantiate that. (Laughter.)

Mr. Wyer: The best facts would be the experience. For instance, Lima, Ohio, at an average price of 28 cents during a certain interval, used an average of $2.46 worth of gas per month. The average monthly consumption was 10,600 feet per consumer during that period. A marked increase in price during a period when there was a very marked shortage of other fuels made no substantial increase.

I have the data here which will make a fair comparison for rates from 25 cents up to in some cases 80 cents, and, for instance, at Atchison, Kansas, with a 25-cent rate, the average monthly consumption was 10,000 cubic feet, the average monthly bill was $2.50. At 80 cents per 1000 feet the average monthly consumption was 3,000 feet and the average monthly bill was $2.40. That is, raising the price from 25 cents to 80 cents made no increase but a slight decrease in the gas company's gross revenue.

That same statement can be applied to most situations where there is a marked increase in price.

Mr. Davis: What is the possible or probable percentage in saving that might be effected by domestic economy compared with the total available supply produced in the fields?

Mr. Wyer: If the domestic consumers would use manufactured gas stoves or raise the burners on their low set natural gas burner stoves as far as cooking operations are concerned, use efficient hot-water heaters, and for heating burn the gas in specially built natural gas furnaces in contrast to burning it in a coal furnace, you can make one foot of gas do the work of three. In other words, for instance, in a town which has an average annual consumption of 120,000 feet per domestic consumer per annum that consumption can be cut down to 40,000 feet and the consumer with proper utilization would get the same service; that is, he would get the same number of units into his food, into his hot water and into his heating area.

Mr. Davis: I think we appreciate the desirability of doing that thing, but if the object is conservation of the supply for the present and future generations, would it not be desirable to cut off or limit the commercial use of gas which consumes two-thirds of the total available supply, which is now sold, and follow a policy of education of the people instead of penalizing them by increasing the price for the benefit of those who have the gas to sell?

My. Wyer: Well, the only reason that industrial gas is sold is that the domestic load varies so largely during different months in the year, that is, through the Central States, the pipe line and distributing plant capacity that is necessary to take care of the peak load on the domestic consumer--the average load on that is only 30 to 33 per cent and the minimum load is down to about 12 or 15 per cent. Now during that peak period under present competitive conditions in the fall and until such time as the Federal Government will not only authorize but make field pooling operations mandatory, it is impossible for one company to entirely conserve the field supply if other

Mr. Duval: I doubt whether there [illegible] that! (Laughter.)

Mr. Myers: The best facts would be the experience. [illegible] average [illegible] per month. The average monthly consumption [illegible] 10,000 [illegible] consumer during that period. A [illegible] increase in price [illegible] a period when there was a very [illegible] shortage of other fuels, [illegible] increase.

I have the data here which will make a fair comparison. [illegible] up to in some cases 80 cents, and, for instance, at [illegible] the [illegible]-cent rate, the average monthly consumption was 10,000 cubic feet, average monthly bill was [illegible]. At 80 cents per 1000 feet the average daily consumption was 5,000 feet and the average monthly bill was [illegible], raising the price from [illegible] cents to 80 cents made an increase [illegible] decrease in the gas company's gross revenue.

The same statement can be applied to most situations where there is a marked increase in price.

Mr. McCarty: That is the reason why the producing companies are saying that [illegible] its domestic economy compares with the total available supply [illegible] in the field?

Mr. Myers: In the domestic consumer [illegible] generations are compared, [illegible] efficient [illegible] heaters, and for heating [illegible] gas [illegible] natural gas furnaces [illegible] furnace, [illegible] can make [illegible] price. In [illegible], for instance, in a town which has [illegible] company [illegible] 1,000 feet [illegible] domestic consumer [illegible] consumption [illegible] 5,000 feet and the consumer [illegible] would get the same [illegible] water and into his heating area.

Mr. Duval: I think we appreciate the desirability of being that [illegible] of the [illegible] is conservation of the supply for the present and future [illegible] the commercial and [illegible] which [illegible] of the [illegible] available supply, which is now [illegible] of the people [illegible] by increasing the price for the benefit of those who have gas to sell?

Mr. Myers: Well, the only reason that industrial gas [illegible] is [illegible] so largely [illegible] different months in the year, that [illegible] through the Central States, the pipe line and distributing plant capacity [illegible] to take care of the peak load on the domestic [illegible] that is only 30 to [illegible] the [illegible] water [illegible] during the fall and [illegible] for one company to entirely [illegible] the field [illegible] other companies are withdrawing gas for industrial purposes. Therefore, concerted uniform action is absolutely necessary.

Now the reason that industrial gas has been sold has been simply this; the domestic price has been so low that not enough income could be obtained from the sale of domestic gas to justify the operation of the company. Therefore, this industrial gas has been sold in most cases during the off-peak period, but, of course, because of its uniform load characteristics has been sold usually at a lower figure. However, at the present time, due to the experience gained in the war period, there are many industrial users who are actually bidding a higher price for industrial gas than the public are willing to pay. For instance, there is one situation in Ohio where the public are paying for domestic service at the gates of a town 18 cents, a number of industrial plants in the immediate vicinity taking the gas from the same line at a uniform load are paying that same wholesale company 35 cents.

It does not require very much arithmetic to figure which way the gas is going.

Now that is a practical fact you have to face. Merely to issue an order that no industrial gas should be sold at any time of the year with the present domestic rate sitation would bankrupt practically every natural gas company in the United States. I do not say every one, but practically every one. Now the two interests there can be gotten together and they can be gotten together along the precise lines you have indicated, that is, by education.

Mr. Davis: I would like to ask one more question. Taking your figures as being representative of the fact that the domestic consumption is about 30 per cent of the total that is produced and the loss in transmission is 35 per cent, is it not reasonable to suppose that the first steps toward conservation should be to stop the wastage of 35 per cent rather than to experiment with an increase in price so vast as you propose?

Mr. Wyer: There are two answers to that: in the first place you cannot eliminate all of that 35 per cent. It is physically impossible to transport gas or anything else without some shrinkage. Even a car of coal starting from the mines in West Virginia going, say, to Toledo, Ohio, has a very marked shrinkage in transit. It is impossible to transmit gas without a marked loss. The 35 per cent can be very greatly curtailed but it can not be eliminated. It can be curtailed only by the expenditure of relatively large amounts of money. As to whether it is good business judgment to spend that money depends entirely on the value of what you are going to save. Therefore, the public's idea as to the value of what you are going to save determines whether that saving will be made. If the gas is not made worth saving that 35 per cent average loss will never be materially curtailed. If the gas is made worth saving, not only can that 35 per cent loss be very greatly curtailed, but by so doing you can very greatly increase the period of time that natural gas will be available.

mpanies are withdrawing gas for industrial purposes. Therefore, concerted niform action is absolutely necessary.

Now the reason that industrial gas has been sold [illegible] has been primarily that e domestic prices have been so low that not enough income could be obtained om the sale of domestic gas to justify the operation of the company. There- ore, this industrial gas has been sold in most cases during the off-peak riods, but, of course, because of its uniform load characteristics has been ld usually at a lower figure. However, at the present time, due to the pr- essure gained in the war period, there are many industrial places that are tually paying a higher price for industrial gas than the public is paying day. For instance, there is one situation in Ohio where the public are ying for domestic service at the gates of a town 18 cents, a number of in- strial plants in the immediate vicinity taking the gas from the same line a uniform load are paying that same wholesale company 30 cents.

It does not require very much arithmetic to figure which way the gas going.

Now that is a practical fact you have to face. Merely to issue an der that no industrial gas should be sold at any time of the year with the esent domestic rate situation would bankrupt practically every natural gas mpany in the United States. I do not say every one, but practically every e. Now the two interests there can be gotten together and they can be got- n together along the precise lines you have indicated, that is, by education.

Mr. Davis: I would like to ask one more question. Taking your figures being representative of the fact that the domestic consumption is about 20 r cent of the total that is produced and the loss in transmission is 35 per nt, is it not reasonable to suppose that the first step toward conservation uld be to stop the wastage of 35 per cent rather than to experiment with increase in price as you propose?

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You must remember this, that at the present time in any community that has natural gas they are getting a very substantial saving. For instance, a community that is paying 30 cents for natural gas with an annual average bill of about $30.00, is getting its heating service for about one-eighth of what it could purchase that same service for from any other commodity. Now it has had that service at this relatively abnormally low figure for a large number of years. It depends entirely on the public's attitude as to whether it thinks it worth while to make that gas worth saving as to whether any saving can be effected either by the consumer or by the gas company. In other words, a consumer that thinks so little of natural gas service that he will not spend a few dollars to have his gas stove repaired will very shortly have no gas service; when he does not have any gas service he has them got to get another fuel. When he gets another fuel, if he gets manufactured gas he will have to buy a new stove which will mean a large cash outlay; if he gets a solid fuel or liquid fuel he will not only have to buy a new stove, but he will have to pay very much more for his fuel. Therefore, the public always get the best of any price relationship that could possibly be considered in the sale of natural gas.

In brief, if natural gas were sold at $1.00 per 1,000 feet, the public would still be getting the benefit of $1.50 per 1,000 as compared with the nearest competing service that could be secured.

Mr. Davis: On what basis do you think the selling price of natural gas should be fixed?

Mr. Wyer: In the first place, the value of the service ought to be considered; secondly, the property used and useful and adapted to public use ought to be taken as the basis; third, an adequate rate of return on that property must be provided for. If adequate rate of return is not provided for then the people who have put their money in that enterprise will never be able to get it out or to continue in the business.

Mr. Gregory: Is it not a fact that the Pennsylvania gas company that supplies the community in which Mr. Davis lives has one of the best records of conservation in their field at large? If Mr. Davis leaves here with the impression that the Pennsylvania Gas Company has a loss of thirty-five per cent it will do that company an injustice. Now my knowledge of the Pennsylvania Gas Company is that that is one of the companies that has a minimum of field loss. They not only take care of their water from the wells by having pumps, but they control their lines and take excellent care of them.

Another point: A manufacturing concern which is using gas that could easily have been diverted to Jamestown two years ago offered as much as 70 cents a 1,000 feet for manufacturing purposes and the decision of the Public Service Commission of Pennsylvania has just been rendered of the amount of gas used for manufacturing purposes of the Pennsylvania Gas Company, which would be very much less than two-thirds.

Mr. Wyer: I thought that I made it clear that the figure I gave, that is, 35 per cent loss, represented our best judgment as to an average condition.

The best information that I have with regard to the particular company referred to is that their loss would be way below that average. There are other companies, of course, that would have a loss above that, but in this particular instance I think the loss would come way below the 35 per cent average.

Mr. Wozencraft: Mr. Wyer, you were discussing a minute ago the advantage of raising the price of gas to consumers with a view, as I take it, of minimizing the amount of gas used by the very large consumers, especially those who use the old type coal burners for heating.

Mr. Wyer: Correct.

Mr. Wozencraft: In Dallas we have had periodic gas shortages for a number of years. This year it has been worse than ever before, and we are working on two plans which I would like to outline very briefly and ask your opinion on.

Mr. Wyer: Proceed.

Mr. Wozencraft: We have two plans in mind, one the determining of the proper amount of gas to be used by a normal family during a month. Let us take that basis, say, as 15,000 cubic feet per month. I would like to ask if in your judgment that would be sufficient to do cooking and keep, say, two rooms warm? We have in mind using the present price of gas for the family which has to use less than 15,000 cubic feet a month, then we have in mind raising the price to a certain extent, to an extent which we believe will perhaps induce conservation but not make the price or cost prohibitive for those families that use, say, between 15,000 and 25,000 feet a month; and then a very sharp increase above 25,000 feet a month, which will practically force the large user, and especially the furnace user, to go to coal or petroleum. That is one possible plan. I should like to have you discuss both the bases, that is, the fact and the possibility of the plan.

Mr. Wyer: Let me answer that and then you can give the second, so as not to get so many.

Mr. Wozencraft: Certainly.

Mr. Wyer: My first suggestion on your 15,000 feet a month limitation is that is too high. 5,000 feet is a better figure to use. Then make your increases on a sliding scale upward from that point. The average family, if they will use gas correctly, can cook, run a hot-water heater, heat a bathroom, and have incidental heating in a bedroom, or anything else like that, with an average consumption of less than 5,000 cubic feet of gas per month. Now all in excess of 5,000 feet is heating service, which, from a conservation viewpoint such as you must face there, costs more because it is a peak load service. The company must hold its equipment there ready to serve, and therefore that service ought to pay a higher price.

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And right at this point I would like to get clearly in your mind that the primary object of a sliding scale upward rate is equality of cost distribution as between different classes of consumers rather than mere conservation per se. That is, the conservations possibilities of the sliding scale upward rate I think has been overstressed.

Does that answer the first part of your question?

Mr. Wozencraft: I should like to ask this additional question with reference to that: Has the sliding scale upward any special conservation value? What we are dealing with right now is the gas shortage. All we are trying to do is to stop the large users of gas from using an amount which prevents the average family from getting any gas at all.

Mr. Wyer: Yes; the sliding scale upward rate tends to drive these large consumers off.

Mr. Wozencraft: Can you suggest an ideal rate using as a basis 50 cents per 1,000 gross of your figures of 5,000 feet?

Mr. Wyer: I would make the increments 5,000; that is, starting out with a unit price for the first 5,000, increasing that then for the next 5,000---

Mr. Wozencraft: How much?

Mr. Wyer: Well, that would depend on what the local conditions are. I would be unable to figure without a knowledge of the local situation, but there usually should be an increase of at least 5 cents per 1,000 on each 5,000 increment, and you may then have this situation----now that would be a local problem that you may have to have a fixed limitation of it. That is, $1.00 natural gas to some people in Dallas may be so cheap, because of its great convenience, that they are willing to take it at that price or any price. For instance, you do not have 3-cent electric energy in Dallas for cooking.

Mr. Wozencraft: No.

Mr. Wyer: Three-cent electric energy for cooking and $5.00 natural gas are cost equivalents. Three-cent electric energy for heating, assuming 100 per cent efficiency for that electric energy and 80 per cent efficiency, which is possible with a natural gas heater, for your natural gas makes the natural gas worth $7.00 a 1,000.

Now there may be a large enough element in Dallas that would be willing to pay almost any price because of the convenience and because of the present acute labor situation, therefore, even a price of $1.00 on a sliding scale upward might not drive them off.

Mr. Wozencraft: I want to come back to the base-price fixing in a minute. Now the second plan we had in mind was fixing a demand charge for large users. In other words, if a man wants the privilege of using 30,000 cubic feet a month or 100,000 cubic feet a month, let him pay a certain fixed charge and then make the gas the same price as to others. Is there any objection to that?

Mr. Wyer: A great deal. Let me answer that fully. When natural gas was first introduced it was sold on a flat rate per fire. That was the first step. Of course that stimulated waste, and the second method was merely to sell natural gas at a straight flat price per 1,000 cubic feet. Every natural gas company has two classes of consumers that are unprofitable; first, those who use so little service that the cost of carrying them must be borne by the others, or those who use so much that the increased cost of the service they receive must be borne by the average.

Now the only way that you can correct the first feature there--that is for those that use so little service that the other consumers will have to stand ready to pay for it--is by a minimum charge or, preferably, a readiness-to-serve charge. Now the minimum charge was the second step of correcting discrimination between different classes of consumers. The next step was the introduction of the readiness-to-serve charge, and I want to make a clear distinction there. A readiness-to-serve charge is merely a charge for standing ready to render service and never includes any unit of service. A minimum charge is a charge for standing ready to serve but, as the term implies, includes a certain definite number of units of service. If those units of service are not used the consumer pays the minimum bill regardless of whether he actually used them. If he pays the minimum bill he is, of course, entitled to those units.

Now the next step is to meet this other class who are responsible for this peak load, and that is where your demand charge comes in. As a matter of equality in rate, or equity in distribution the so-called three-way rate, the combination of readiness to serve, demand and unit price is the ideal way of charging for natural gas service, but it has this disadvantage, that it is complicated and is somewhat difficult to understand by the public, and there may be some prejudice against it; but nothing can be said against it as a matter of equitably distributing the costs.

Mr. Wozencraft: You referred several times, Mr. Wyer, to the equivalent of service; that is, b.t., as I understand it, of gas and coal and other heating substances.

Mr. Wyer: Yes, sir.

Mr. Wozencraft: It seems to me that you are taking as a possible basis for value of natural gas the high maximum, or the maximum charge which the public would be willing to pay for natural gas, more than the same amount of heat derived from coal would cost. Naturally the public would use coal unless the increase in difference of cost made it attractive to them.

Mr. Wyer: That is correct.

Mr. Wozencraft: Is it not a fairer plan to consider the actual expenditure of the gas companies, the necessary amortization of their plants, pipe lines and the probable duration of the field and base the price of natural gas upon a fair return to the gas company, including a charge for

their service rendered, and not upon the high maximum which the public might be willing to pay.

Mr. Wyer: Well, I did not mean to give the impression here that I was advocating from a rate-making viewpoint the valuation doctrine as the basis solely of making rates. My idea was it was one of the factors that ought to be considered.

The summary you have given is, of course, the correct legal situation and is the situation that has been followed by courts and commissions; that is, the public are to pay, theoretically at least, an adequate return on the present fair value of the property used and useful and devoted to the public use.

Mr. Wozencraft: Is it fair to take the gas holdings of a company at the price which they paid for that, or should a speculative value be added?

You will excuse me, Mr. Wyer. I am in this position: We are faced right now with the gas situation in Dallas. There is no public utility or public service commission in Dallas. We have got to fight the situation out on our own. I have been in the East for two weeks trying to get information about various phases. I do not want to bother this conference and if I weary the conference with my questions I am sure they will tell me, but I would like to ask two or three questions along that line if I am not encroaching on their time.

Mr. Wyer: My viewpoint of the question that you have raised is that the legal situation is as follows: a natural gas leasehold or a mineral deposit is a property right. It is just as much a property right as a building, and while the gas industry is predicated on that property right, if that property right is not properly provided for in the company's property base, which might be called the rate base, you are in effect confiscating part of the property and removing incidentally all incentive for going into the natural gas business.

The big feature that has been overlooked in the natural gas rate situation is that, just as Secretary Lane expressed this morning generally without applying it to a local situation, you must not only provide for the normal maintenance of your company but you must find the incentive to make this gambler go out and take the long chance that he must take in developing the new supplies. Now unless those new supplies are secured the public will not get the gas. Therefore, the public is served best, because I have never known a situation where natural gas was not sold at a figure way below the cost of the nearest competing commodity for service, and, therefore, the public is served best when natural gas hunting is made profitable; that is, the more people you can get out hunting for new supplies the better it is for the public. Now the only way you can stimulate is that the hunting propensity must be stimulated by the return.

Mr. Wozencraft: What in your judgment is the proper return on natural gas property in this country?

Mr. Wyer: On present day property value as a general statement, without applying this to any particular situation, 16 per cent for sinking fund to maintain the property value so that, for instance, by starting out today with a million dollars' worth of property, at the end of ten years we either have a million dollar's worth of property or enough reserve in the sinking fund to make up the shrinkage. Secondly, a 6 per cent return for interest, and 4 per cent for profit. That is, the total return for sinking fund, interest and profit ought to be, as a general average, at least 26 per cent.

Mr. Wozencraft: One more question and I am through: In your judgment should natural gas use be limited to domestic consumption and cut off from commercial uses? In explanation let me say just this: we have in the summertime a large number of boiler gas users, men who use gas in manufacturing plants and in the winter time they are cut off. Should they be cut off in the summer too?

Mr. Wyer: That has two answers. Theoretically there is no question but what the industrial users should come off. Practically you have the two-fold difficulty that I mentioned before. In the first place, unless your producing company has the control of the field, so that they can actually save the gas, somebody else will probably take that gas. Now if they keep a large pipe-line system, compressing stations and distributing plants, this readiness to serve the peak load in the winter time--if that is not in use in the summer time you will not alter materially the total cost of operating. For instance, analyzing any natural gas company, you will find about 70 per cent of all of the costs go on regardless of whether you are doing any business. Now if you are going to eliminate the industrial gas, these costs will then have to be borne by a smaller volume and that will have the practical effect of increasing the price.

There are many communities that I think would be justified in immediately, providing the field conditions will permit it, insisting upon the elimination of industrial gas and paying the additional price to make the gas company save that gas for future domestic service. There again, however, you are squarely against the practicaly aspect of what the public thinks the gas is worth.

Mr. Wozencraft: The demand charge would take care of that additional cost, would it?

Mr. Wyer: Well, that all depends. It could be made to take care of it. It is entirely feasible.

Mr. Fisher (of Bartlesville, Oklahoma): This ideal three-part rate has been referred to as the theoretically perfect way to sell gas. It is

devised primarily to get the greatest incentive on the part of the consumer to conserve and use gas efficiently in his own behalf and not merely as an altruistic basis. I think it was originally proposed by Mr. Doherty and was recommended in 1917 by the Chamber of Commerce of Kansas City as a solution for the difficulties on the Kansas Natural system.

There are facts available right now in regard to its actual application. It was sanctioned by the Public Utilities Commission of Kansas about three months ago and accepted by the city of Ottawa as the primary town, and a canvass of the homes in that city and the application of the rates there has shown some very remarkable economies effected in the domestic use of gas there.

Just purely for the benefit of each consumer under this rate for 60 days a working party of about 45 men has been working in that town adjusting the appliances of the consumers to get them on a basis of economical use, as far as could be done, without any great expense by merely simple adjustments made in their present appliances and without purchasing to any extent new appliances. There are in the city about 2,000 consumers, about half of whose homes have already been adjusted in this way, not spending any material amount of money in each home, and the net result of it has been that that city has been burning gas under an 80 cent rate and has called for about 6,000 feet per consumer per month in winter and about 2,500 to 3,000 feet in summer. The homes that have been adjusted, taken as a whole, have reduced the amount of gas needed in the homes from 85 feet per hour to about 35 feet per hour, getting exactly the same service, and there are included in that figure a number of consumers who have put on additional appliances to get a little heating with the gas that they are saving from their other operations, so that there is in addition to the service they were getting before some additional heating load.

A canvass of about 3,000 consumers, including Ottawa and a selected list of consumers in Kansas City and Topeka, showed a theoretical reduction in the use almost identical with what our actual experience was in adjusting the consumers' appliances in Ottawa. These towns, of course, were all on a largely cooking water heating and small incidental heating load. It looks as though they would be able with the same amount of gas heretofore put into the town to carry a material amount of incidental heating on top of the previous load and realize a saving in gas, or saving in the gas revenue per consumer. But the company in turn will be relieved in considerable measure of the factor of the difference between the summer and winter load. In other words, the difference previously of 2,500 to 6,000 feet, which is a very small difference due to their 80 cent price, will be reduced under the three-part rate, because the way in which that demand charge is applied is to install on the service to each consumer a device that will limit his use of gas to the amount that he contracts for and for which he pays the demand charge. If he has a 35 feet per hour contract that is all the gas he can secure and he pays for that 32 cents per foot annually or one-twelth of that fee monthly. It is then to his interest to get devices which will give the service designed primarily to give the greatest incentive on the part of the consumer to conserve and use gas efficiently in his own behalf and not merely as an altruistic matter. I think it was originally proposed by Mr. Doherty and was recommended in 1912 by the Chamber of Commerce of Kansas City as a solution for the difficulties on the Kansas Natural systems.

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Just purely for the benefit of each consumer under this rate, for 90 days a working party of about 45 men has been working in that town adjusting the appliances of the consumers to get them on a basis of economical use, as far as could be done without any great expense by merely simple adjustments made in their present appliances and without purchasing to any extent new appliances. There are in the city about 3,000 consumers, about half of those homes have already been adjusted in this way, not spending any material amount of money in each home, and the net result of it has been that that city has been burning gas under an 80 cent rate and has called for about 6,000 feet per consumer per month in winter and about 2,500 to 3,000 feet in summer. The homes that have been adjusted, taken as a whole, have reduced the amount of gas needed in the home from 65 feet per hour to about 35 feet per hour, getting exactly the same service, and there are included in that figure a number of consumers who have put on additional appliances to get additional heating with the gas that they are saving from their other operations, so that there is in addition to the service they were getting before some additional heating demands.

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There has been a great deal said for the last 2½ years about this on a theoretical basis and I think we have right now the first figures from the actual application in practice of that method of charging, and it probably will be applied generally to gas in the Mid-Continent field beginning with Ottawa and extending out to many fields, in the near future.

Dr. Manning: The hour is approaching, ladies and gentlemen, when we should adjourn. Of course, we should be glad to have you stay here as long as you want, but I assume some want to get away this afternoon, so if you want to turn to any other subject aside from the technical ones, you are at liberty to do so.

I would like to say at this point that this question of price fixing is something that does not interest me very much. I am perfectly frank with you. I have had nothing to do with price fixing since the war began and now that it is over I do not want to undertake it.

It has been our function in the past when cities have asked us to make surveys, to go after the facts and present them and put it up to the price-fixing agency, and I want it distinctly understood that the Bureau of Mines is not going to take the attitude of a price-fixing agency.

Mr. Walker (Oklahoma): A question has been put to the Corporation Commission of Oklahoma a number of times recently as to the amount or per cent of the B.t.u. taken from gas put through absorption or gasoline plants; that is, the average natural dry gas.

Mr. Wyer: As regards the average so-called dry gas, when the gasoline vapor mechanically mixed with the gas is precipitated and removed, it lowers the heating value of the mixture of the two somewhere between two and three per cent. However, the average heating content of the vapor exists in such a form that little of it ever got to the ultimate consumer, and if it did get to the ultimate consumer the ultimate consumer's appliance would not be able to use it; that is, the ordinary cook stove; the ordinary incandescent mantle lamp can not burn a vapor. In fact, the presence of a gasoline vapor in gas used for illumination in a mantle is an actual detriment to the gas. Does that answer that question?

Mr. Walker: Your theory is then there is very little loss to it, if any?

Mr. Wyer: That happens to be the actual fact; it is not a theory.

Mr. Walker: That is what I mean.

Mr. Wyer: Shrinkage in B.t.u. content of the mechanical mixture of gasoline vapor and natural gas is somewhere between 2 and 3 per cent as a

general average. Of course, in casing-head gas, where the gas comes directly from an oil well and where it is a direct by-product of the oil, the amount of vapor carried in that gas is very much larger, it is always referred to as a "wet" gas.

Mr. Lewis: I might add for Mr. Walker's information that lately we have conducted experiments and we find that the average loss is about three per cent. Of course, that varies with the nature of the gas, etc. One thing that is seldom considered is that in taking out the gasoline vapor there is a shrinkage in the volume of the gas that is not metered, so the result is that the gas which is metered afterward does not show a very great loss; probably about 3 per cent. That will be made public very shortly in a technical paper that is now in the press.

Mr. Murrer (of Cincinnati): You were speaking on conservation of gas and fixing a price. I believe if you set a price so far as has been stated, even go so far as to treble the price of gas you give the big consumer, it would not keep him from using it with the overwhelming good he gets out of using gas. He can easily pay a large price for it. The value is great to him.

I believe, when it comes down to the close of it, the necessity for conservation of gas, the only way is to eliminate that two-thirds that is being used for no other than industrial purposes. It can be eliminated. The industrial use can be substituted for by the use of coal, but you can not very easily turn right around and go into a million homes, probably, in the country, and tell them they have got to conserve, or use different appliances, or stuff of that nature. I really believe the gas is here for the use of the people. It is nothing but a natural resource and it should be used for the purposes and for the people, for the good of the people, not for the good of a gas company or some industrial concern, or anything of that nature. If you are going to conserve it, conserve it, but conserve it for the purpose of benefiting the public, the great commonwealth, regardless of how much good it is going to do to the gas company or anyone else. We are not here to discuss the profits of the gas companies. We are here to discuss the conservation of gas. If the gas company does not get enough profit out of the public using the gas, I say eliminate the gas company. We have come now and are right now where we are coming down to the sense of things, things that should be operated and be used by the public, things that should be operated and used for the public welfare, not for the welfare of a corporation. I maintain that statement.

I am up here representing the city of Cincinnati, and Cincinnati is largely made up of nothing whatever but the commonwealth, or the poor class of people, or, in other words, the overwhelming public, not the Union Gas and Electric Company, or anyone else. We are here to conserve gas, and if it necessitates it, limit the commercial use of it and keep it for the good and welfare of the commonwealth.

Mr. Saul Zielonka (City Solicitor, Cincinnati, Ohio): Mr. Chairman, ladies and gentlemen, I am from the city of Cincinnati and I represent the city of Cincinnati.

Mr. Murrer: I have the credentials that show I represent it.

Mr. Zielonka: Mr. Murrer is a volunteer and has a credential from the Mayor, but the only credential for representing the city of Cincinnati is held by me, and in the letter it says Mr. Murrer has a letter from the Mayor.

Now the city of Cincinnati has always maintained and still maintains that a public utility is entitled to live (Applause), and is always entitled to a fair return on its investment. We have had a traction franchise revision and that is one of the elements we took into consideration when we revised the traction franchise, and if we were to revise any other franchises,--gas, electric or any other, we intend giving a square deal to everybody.(Applause.)

Mr. Denning (of Pittsburgh): Mr. Wyer, there has developed a tendency in the last year or two in the action of municipal councils and other bodies to penalize gas companies in periods of low pressure in distributing mains by requiring a discount on bills rendered for service in those periods. I would like to get you to express an opinion on that practice.

Mr. Wyer: The enforcement of a penalty discount during the low-pressure period I think is squarely against conservation for this very simple reason: The local situation in any town which is responsible for the low-pressure condition is brought about primarily by the inefficient appliances which the domestic consumer has and in which he is using the gas. Just as soon as the average consumer finds out he is going to get his gas for a lower figure, and that in an already acute situation when everybody is short of gas, instead of trying to save it they will open up their cocks wide on the theory that the more gas they can waste the greater will be the reduction in pressure, therefore, the greater will be the penalty discount until such a time is reached that theoretically the gas company might be considered actually to owe the consumer money. That is, of course, an extreme, but in the four cases where the penalty discount has been enforced I am quite sure that had the local public used efficient appliances and had an ordinary appreciation as to the value of natural gas existing in those communities, there would not have been any occasion for a penalty discount. Therefore, the enforcement of a penalty discount is fundamentally wrong from a conservation viewpoint. It is fundamentally wrong because it tends to attempt to standardize what is already a wasteful pressure situation. That is, four ounces is too high for good service at the consumer's fixtures. There is no particular merit or virtue in four ounces, and, in fact, as is shown on this chart, the consumer with proper utilization in the cook stove will actually get better service at the lower pressure than at the higher pressure, provided properly directed flames are used.

Mr. Powers: Mr. Wyer, it might be interesting for you to know this was borne out at Oklahoma City where I have been working on the propaganda for open-top stoves and higher efficiency. Just before Christmas I was in Oklahoma City when the gas fell and people were using open-top gas ranges and getting service and made no complaint, where people across the hall in the same apartment building using the old low-burner closed-top range could not get gas to cook with.

Another question that comes up that I have heard down in that country repeatedly from the gas men is the question what are you going to do with the fumes and vapors with the open-top gas ranges. I want to say we have gone through the winter and we have had no vapors to take care of. The open-top ranges have worked very satisfactorily.

Mr. Wyer: Supplementing what Mr. Powers has stated, it is my observation that if the present wasteful closed-top stoves were eliminated and skeleton lids or grate tops substituted and the burners on existing gas stoves raised so as to convert those stoves into practically manufactured gas ranges you would eliminate more than 90 per cent of your complaints of inadequate or low service during the low-pressure period.

Mr. Godfrey Cabot (Boston): I would like to say a few words in the viewpoint, in the first place, of a practical operator in natural gas and, in the second place, in the viewpoint of a chemist.

In the viewpoint of a gas operator I would like to call attention to the fact it was officially stated early in these proceedings that probably half of all natural gas that ever has come to the surface in this country by reason of man's operations has been entirely wasted by passing into the open air, and it seems to me that this being still the greatest individual cause of waste that much can be accomplished by the more thorough enforcement of various State and Federal laws looking to the prevention of the waste of gas.

The second thing I would like to call attention to is this: Every 1,000 cubic feet of natural gas that is burned produces 110 pounds on an average of carbonic acid gas, which is the vicious gas that mammals eliminate from the lungs, and it is the sole function of the lung to eliminate this more or less poisonous gas from the blood. Therefore, if natural gas is consumed in our houses under such conditions that the products of combustion pass into the air of the room it is very injurious to human health, and I have known of many cases of illness where this was a predisposing cause of the illness.

As a chemist some forty years ago I made a series of analytical determinations of the air in various lecture halls. It is the general opinion of physicians that after you pass the limit of 16 parts per 10,000 of volume of natural gas, which is four times the amount in the natural air there is a perceptible depression. It makes you drowsy, for instance; and if the proportion gets much beyond that it is a predisposing cause of disease. And I have noticed that a very large part of the gas consumption for domestic use in this country is in flueless stoves or in fireplaces where

the flues are inadequate or have been stopped up. In Kansas City they have passed a city ordinance making it contrary to law for certain classes of consumers-- I do not know what the classes are but I think stores and hotels-- to consume natural gas under those conditions, and I think that is a very important matter that ought to be acted upon by the public authorities in every place where natural gas is consumed. I know that is the opinion of physicians and I feel certain as a chemist that it is a very important matter which has not been sufficiently emphasized in publications.

Dr. Manning: Ladies and gentlemen, I think at this time it is wise to go rather to the economic side of this problem than to discuss in detail the technical problems, which I am sure can be solved.

It seems to me there are three factors we have to consider connected with this whole matter: (1) A reduction to the consumer in his gas bills by more efficient methods; (2), to increase the capability of distributing systems for rendering service at all times, and particularly in the cold weather; and (3) to prolong the supply.

These facts, assuming that they can be demonstrated, give rise to the question how can these economies be effected in the best way?

Is this system proposed by Pennsylvania the best system? If not, what other system, or how may this Pennsylvania system in the opinion of those present be modified or extended to advantage?

Now it is, I think, fortunate that we have the public utility people and city officials here with the producers and that we can discuss these matters in an amiable frame of mind. I want to ask Mr. Bigelow, who is a writer, as you know, and has had much to do with the gas people, to take about five minutes to give us his views on this subject of the campaign that should be carried out. Later on I assume there are some resolutions to be adopted and I am acting on the assumption you are going to leave the city this afternoon, and not continue tomorrow, because I think we can close today.

REMARKS OF MR. BIGELOW .

I knew so little about it that I was just asking the question right in line with what Mr. Manning has suggested. The fact of the case is that in the artificial gas field there has been an immense amount of attention given to the appliances; more, perhaps, in very concrete form during the last eight or ten years than prior to that time; but the manufacturers in that field have come very closely in touch---I am speaking now of the manufacturers of gas-burning appliances---have come very closely in touch with the manufacturers of gas. Prior to that time the manufacturer of gas-burning appliances was largely considered as a camp follower when he attended a convention. Nowadays, however, appliance manufacturers are on the directorate of our biggest gas association, the National Association, in that field, and they are taken into conferences, made members of committees, and their side of the

proposition as well as the gas man's side is being considered jointly. We are arriving at very splendid results.

We have with us today a manufacturer of gas ranges in that field who has had years and years of experience, and I feel that if in this industry the gas-appliance manufacturer were haled into meetings--I am not speaking now of the manufacturer of derricks and drills and that sort of thing, he is not touched--but I would like to see very much indeed the manufacturer of gas-burning appliances brought into these conferences, not only that his opinion might be ascertained, but that he might be given ideas derived from practical experience, such as Mr. Wyer has had, such as other men in this industry have had.

The whole tendency on the part of the manufacturer of gas-burning appliances, such as ranges and burners, in this field, as you all know, has been practically nothing but how cheap can I make the appliance and how broadcast can I sell it, and that sort of thing. We have gotten away from that. And while I agree that there are many sides to this subject as to how we shall arrive at higher rates, how we shall satisfy the public, how we shall get the public with us in the matter, and that sort of thing, whether we shall force it upon them or whether we shall get voluntary aid on their part towards getting higher prices for gas--all that sort of thing is allright, but at the same time we have got to give the public something for their money; we have got to give the public something for their confidence; we have got to give the public something that is going to invite them to accept the suggestions from the gasman's side. So I believe that this matter of the gas range and other gas-burning appliances is by no means too small a subject to be given very vital attention.

I have heard one or two men this morning on the side say they thought this was a very small subject; it did not amount to anything; that the vital question was a bigger question than this. Now it is an underlying stratum on which we have got to build, the confidence of the people, giving the people something that is worth while in their appliances. So, as I say again, you should under the impetus that has been given through this conference here, get these manufacturers in and convert the manufacturer who has no object in life except what money he can get out of it--convert him to considering the subject of how can I build an appliance that will give the public the very best results, that will help to conserve gas and that shall not cost the public any more either in the purchase price of the apparatus or the purchase price of the gas used. If we can develop the commercial side of this industry it will be a magnificent thing, and that commercial side is a vital side.

Col. Roper is here and knows a whole lot about gas ranges. He has built them for years; he knows how perfectly splendid are the ranges sold today in the artificial gas field, and yet the manufacturer of artificial gas ranges is not satisfied. There are several types I know of today, not on the market, but coming soon. I know of certain ranges that are going to

be put on the market that will be sold for the burning of either artificial or natural gas without any change of burner, without any change of adjustment except some simple adjustment, if necessary; and ranges that can be put on the market and used for either gas and, therefore, sold by the manufacturer to go into the town that now uses natural gas and that in the future may use artificial gas. And recollect that would fit in exactly with what Mr. Wyer has been discussing in the matter of the short flame, properly directed results, and though I have spoken of one design in particular I do not mean to suggest that the other manufacturers of gas ranges have not perhaps in mind already the same sort of thing, but if they have not, if the natural gas field will give them the incentive by adopting a uniform height of burner and short flame, and low pressure, you will get some of the gas appliance manufacturers in the United States building for the natural gas field.(Applause.

Dr. Manning: Is there any suggestion any member of this conference would like to make? If so, we would like to have it.

REMARKS OF MR. G. D. ROPER. (Of Rockford, Ill)

Inasmuch as Mr. Bigelow took the liberty of mentioning my name, I think I could tell you in five minutes what has taken 35 years to tell the manufactured gas people. Over 30 years ago I started on the principle of what they should do and I have been steadily after them. The whole trouble is, I feel, in the natural gas field, the same as it was 30 years ago, and it has taken a long time to convince, as I said, the manufactured gas people, and that trouble is that the gas people themselves do not take interest in the appliances that are being sold and have allowed them to be sold by any junk dealer or plumber or anybody else whose interest was only in them to the extent of how much can I get out of it. And then it was gone. And you can not go into the natural gas field today and find a man that will take interest enough in his own product to listen to what is absolutely a truth.

Now that was the condition with the manufactured gas appliance people. They had the ideas.

Mr. Bigelow said that a man that manufactured was a supply man. Well, I suppose he is. I would like to know what a gas man is. He is a supply man. I do not know anybody that is not. If he is not he ought to be ashamed of himself. One of the idle rich, one who has not any interest in life. The whole truth is, if they will take this thing up and handle the goods themselves they will see that they come in. The goods are on the market now, not coming, as Mr. Bigelow said. I am surprised that the publisher of a magazine did not know that. I supposed editorial writers knew all these things quick. They are all here. It is only that you folks don't know it. Here's a man that is talking about stoves that have been on the market I don't know how long, and I have sold 90 per cent of all the goods I have ever sold in my life to the gas company, but you don't find anybody among the natural gas people because they would not look at you. They know a little too much. (Applause.)

be put on the market, that can be sold cheaply, for the burning of either artificial or natural gas without any change of burners, without any changing of adjustment except some simple adjustment, if necessary, and ranges that can be put on the market and used for either gas and, therefore, sold by the manufacturer to go into the town that now uses natural gas and that in the future may use artificial gas, and to conduct the works there satisfactorily with that. There has been discussion in the matter of the inner flame, properly directed products, and though I have spoken of gas design in particular I do not mean to suggest that the other manufacturers, if they have not, do not have in mind already the same sort of thing, but in the time when the natural gas field will give them the incentive by supplying a uniform height of flame and short flame, and low pressure, you will get the co-operation of the gas appliance manufacturers in the United States building for the natural gas field. (Applause)

The CHAIRMAN: Is there any presentation any member of this conference would like to make? If so, we would like to have it.

REMARKS OF MR. G. D. ROPER. (Of Rockford, Ill)

Inasmuch as Mr. Bigelow took the liberty of mentioning my name, I think I could tell you in five minutes what I talked 30 years ago to the manufactured gas people. Over 30 years ago I stood for the principle of what they should do and I have been patiently waiting these 30 years through these years. In the natural gas field, the same old thing as 20 years ago, and it has taken a long time to convince, as I said, the manufactured gas people, and that trouble is that the gas people themselves did not take interest in the appliances that are being sold and have allowed them to be sold by any junk dealer or plumber or anybody else whose interest is only in them to the extent of how much can I get out of it today, and that is not good. And you can not go into the natural gas field today and tell the man who will take interest enough in his own product to listen to what is absolutely a truth.

Now what was the condition with the manufactured gas appliance people. They had the ideas.

Mr. Bigelow said that the man that manufactured was a supply man. Well, I suppose he is. I would like to say that although it is rough, he is a supply man. I do not know anybody that is not. If he is not, he ought to be ashamed of himself. One of the ideas, then, one who has been any too much in fire, [illegible] is that they will take this thing in hand, the goods [illegible] they what, [illegible] that they come now [illegible] upon the market now, not coming. As Mr. Bigelow said, I am surprised that the publisher of a magazine did not know that. I supposed editors and writers knew all these things quick. They are all very strong that they think they know it.

Now, what I am talking about is 90 per cent of the things on the market I know now, and I have sold 90 per cent of all the goods I have ever sold in my life [illegible] any company, but I can not find anybody among the natural gas people because they would not look at you. They know a little too much. (Applause.)

REMARKS OF MR. FISHER.

In every conference on this subject that I have attended someone always proposes that the first small quantity of gas should be sold for a low rate, or that for some reason or other some special modification ought to be made in the interest of the working class and the poor consumer whereby his burdens are carried by somebody else. Our actual experience in visiting the homes of the people and fixing their burners upon an economical basis has shown us that the way to benefit the poor consumer is not to pay his fare and carry him for nothing, or something of that kind, but is to teach him to make the best use of what he gets. As a rule he is a man we find that pays the highest price for coal, he is the man that pays the highest price for potatoes, the highest price for everything else, and we have had innumerable cases where we go into a man's house and find him burning gas with a coal stove with a pipe stuck into it, and taking anywheres from 200 to 300 feet an hour to do his cooking, whereas if he would spend 50 cents to put a better burner on his stove, and get it in better condition, this would enable it to do better with a consumption of 30 feet instead of 300. The real thing is to show a man the way and how to do it instead of making somebody else carry part of his burden.

The Chairman: There is one gentleman I might ask to give his advice, a gentleman whom we might call the dean of the gas industry. That is Mr. McDowell of Pittsburgh. (Applause.)

REMARKS OF MR. MCDOWELL

I have listened to this discussion with a great deal of interest. I have been listening to such discussions for--I would hate to say how many years--nearly forty years, because I laid the first large gas line that was ever laid, and I have watched it all through. I have listened to some slanders on the gas man and some undue praise, but I have been impressed with the narrow points that we have touched in this convention on the great question of conservation. We have scarcely touched it at all.

Do you know that according to the statements here--I have been thinking it over--we have a very clear statement, and I think we will all of us agree with the statement--I have followed it very closely and it meets my judgment--that at least one-half of the gas produced at the wells is wasted in an insidious manner. It is not obvious. If it was obvious it would be stopped. Now if one-half is being wasted we have the equivalent of 25,000 tons of coal a day burning up, on fire, consumed, wasted.

Now if there was a pile of coal anywhere in the United States with 25,000 tons burning every day the first thing you would do would be to insist on the owners of that coal putting it out, and they would make every effort they could to stop that fire. If they could not put it out the State

would start in to stop it and if the State could not stop it the Federal Government would. It would be stopped.

Now this waste is going on and ought to be stopped, and it is going to be stopped to a great extent. The character of the product dealt in is such that not every bit of waste can be stopped, but it can and must be stopped.

Now I take it we have not met here this afternoon simply to listen to these discussions, but that we want to follow it up with some concrete, some definite things, and with that in view I have some resolutions here that I want to propose, Mr. Chairman, with your consent, and I offer this resolution.

WHEREAS the supply of natural gas is limited in quantity and is not being replaced by Nature, and

WHEREAS there is no other fuel that can replace natural gas which is as cheap, as convenient and as efficient, and

WHEREAS the supply of natural gas is failing in many communities:

BE IT RESOLVED, in order that the supply of natural gas may be prolonged and the service improved, this Conference recommends that the appropriate agency in each State which uses natural gas take measures to discover what amount of natural gas is now being wasted by the consumer, the various causes of such waste, and adopt such measures as may be available to reduce such wastes and effect economies in order that the benefits from this natural resource be prolonged, and

BE IT FURTHER RESOLVED that the appropriate agencies, both State and Federal, be urged to stimulate research in perfecting means and methods for a more efficient use of natural gas, and

BE IT FURTHER RESOLVED that the appropriate State and Federal agencies be urged to conduct educational campaigns to instruct consumers and the public in the importance of the wastes of natural gas; how economies in the use of natural gas may be effected, and on the natural gas situation in general, that the public may be informed on the subject and deal with it in the most intelligent manner, and

BE IT FURTHER RESOLVED that every effort be made towards arriving at understandings between the natural gas industry and the communities using natural gas as to how the supply of natural gas can be best conserved and its life prolonged, and

BE IT FURTHER RESOLVED that a committee of ten (10) be appointed by the Chairman of this Conference to represent the natural gas industry, and the public and Federal institutions to cooperate with the Director of the Bureau of Mines in working out a constructive program for the conservation of natural gas and the bettering of the natural gas service, and in collecting and distributing information on this subject.

Mr. Weil (of Pittsburgh): Mr. Chairman, I rise to second this motion and to say a few words in support thereof, as representing a large number of gas companies, not all, of course, but a very considerable number who are interested in this Conference. This is an era of change, of revolution. Old governments are being set aside, old business methods and old prejudices are being wiped out, and this conference in which the representatives of the National Government, the representatives of the States, public service commissions, mayors of many municipalities, and of the natural gas companies have assembled for the purpose of discussing their mutual interest and what will best serve the public, is the best illustration, I think, that could be given of the changed attitude of the times on all great public questions. It is like the case of the Southern beauty who remarked she was 18 years old before she knew that damn Yankee was two words. Now I think the time has arrived when it can be demonstrated that damn gas company is more than one word.

The gas companies of this country have invested in the gas industry approximately $500,000,000 to $750,000,000, and that takes no account of the hundreds of millions that have been lost by those who entered into the enterprise and fell by the wayside. The natural gas business grew from the early 80's to the present date. Many of the old appliances have been discarded, many of the old pipe lines that were built have been renewed and improved, and I have no doubt that this general estimate of average waste can be accounted for by some of those old plants that have not yet been replaced with the modern plant, the plant that has been built recently by these gas companies having this enormous investment, attention, thought, the best experts that can be obtained, have been put upon that operation because it means dollars to the gas companies to stop this waste in their own plants.

There are local conditions affecting some States, some localities, that do not obtain in others. Those must be considered, of course, when any of these questions are to come forward. But on behalf of the gas companies I want to say that we welcome this investigation, this campaign of education, this opportunity to get together all parties interested in the production, the supply, the consumption of gas, so that the interests of all may be protected, so that all may be educated.

If there is further information that can be given to the gas companies, whereby their properties can be protected and preserved, of course, they will be glad to avail themselves of that information from whatever source it comes, and so we welcome the chance now through some other agency than the natural gas companies, through the governmental agency and the assistance of the various States and localities, to take the consumer, the public, into the confidence of the gas companies in the operation of this business and inform them of every department thereof, of every difficulty with which the gas company has to contend, and to ask the assistance of the consumer after he is fully advised and instructed as to the best methods to conserve this greatest of all fuels which is to be conserved and used

Mr. Neff (of Pittsburgh): Mr. Chairman, I rise to second the motion and to make a few words in support thereof, representing, as I do, a large number of gas companies, not all, of course, but a very considerable number who are interested in this Conference. Only by reason of [illegible] governments are being set aside, [illegible] are being wiped out, and this conference in which the representatives of the National Government, the representatives of the States, and the natural gas associations, mayors of many municipalities, and of their natural gas companies have assembled for the purpose of discussing their mutual interests, and which will best serve the public, is the best illustration [illegible] of the changed conditions of the times [illegible]. It is like the case of the [illegible] who remarked [illegible] before he knew that damn Yankee was two words. I think the time has arrived when it can be demonstrated that damn gas company is more than one word.

The gas companies of this country have invested in the gas industry approximately $600,000,000 to $750,000,000, and no one takes into account the hundreds of millions that have been lost by those who entered into the enterprise and fell by the wayside. The natural gas business grew from the early 80's to the present date. Many of the old appliances have been discarded, many of the old pipe lines that were built have been renewed and improved, and I have no doubt that this gentleman's estimate of average waste can be accounted for by some of those old plants that have not yet been replaced with the modern plant, the plant that has been built recently. But these gas companies having this enormous investment, of course, though the best experts that can be obtained, have been put upon that proposition because it means dollars to the gas companies to stop this waste in their own plants.

There are local conditions affecting some States, and localities, that do not obtain in others. Those must be considered, of course, when any of these questions are to come forward. But on behalf of the gas companies I want to say that we welcome this investigation, this conference, this opportunity to get together all parties interested in the production, the supply, the consumption of gas, so that the interests of all may be protected, so that all may be educated.

If there is further information that can be had or suggested to the gas companies, whereby their properties can be protected and preserved, of course, they will be glad to avail themselves of that information, from whatever source it comes, and so we welcome the chance now through some other agency than the natural gas companies, through the governmental agency and the assistance of the various States and localities, to take the consumer, the public, into the confidence of the gas companies in the operation of this business and inform them of every department, of every detail of the business with which the gas company has to contend, and to have the assistance of the consumer after he is fully advised and instructed as to the best methods to conserve this greatest of all fuels which is to be conserved and used.

for the benefit of all, for the benefit of the public, for the benefit of the gas company, but primarily, principally and chiefly for the benefit of the public.

I take great pleasure in seconding this resolution so that this campaign of education may start. (Applause.)

Dr. Manning: The motion has been made and seconded. Is there any discussion?

Mr. John A. Barhite: I have sat here today and listened to this discussion with a great deal of interest, and I have done so as an unpredjudiced observer. For the last three years it has been my lot to hear and pass upon the various questions which from time to time arise between the natural gas companies and their consumers. Whatever I know about the question of natural gas, about the difficulties which may pertain to its production and to its distribution, has come to me through knowledge that we have gained from people on the stand who have had practical experience in those matters.

With regard to the conservation of natural gas, I started upon my investigation with the theory that the profession to which I have the honor to belong, that of the law, was more responsible for the waste of natural gas than any other set of people, (Laughter), but I am very glad to find from time to time that my views on that subject have changed, and I believe that this set of resolutions which has been offered by Mr. McDowell is one in the proper line and one which should be passed and carried out to the best of the committee's ability.

The great trouble with the natural gas question today, and it is an important one--it is more important than I conceived of when my attention was first called to it; it is more important than the average citizen recognizes today--the only thing that is going to save to this country natural gas for any length of time is conservation and care in its use.

I hear both sides of the question. I hear the consumer who is convinced that there is pelnty of natural gas in the country but that the companies for some reason of their own are holding it back, and one of the great difficulties which the commissions of this country and of these States have today is educating the public in the proper use of natural gas. For years passed it has been plentiful and it has been cheap and nobody cared in particular how much he used. But now at this time, when it is not plentiful, when in many cases the companies are asking for a greater rate, the people can not understand why they should not go on with the old style of apparatus which has served them for so long, that is, with the old style of cooking arrangement, and the great difficulty with this question, as I say, is with the public.

Now I am very glad to see that the companies have, those which I know anything about, loyally taken up this question and are supporting the

commissions to the best of their ability in order to conserve the supply of natural gas, and I believe that these resolutions which have been offered here are a step in the right direction, and if a committee is appointed that will take charge of that matter and give it the best results of their investigation every man who has come here today is well repaid for his expense and the time which he has spent. And not only that, but it will be a step in the right direction which will preserve to the people of this country the most useful and important of their natural utilities. (Applause.)

Dr. Manning: Is there any further discussion on this question? Are you ready for the question?

The motion being put to vote was unanimously carried.

Dr. Manning: In connection with the appointment of this committee with Secretary Lane as Chairman of it, I would be glad to have you or the associations which you represent--I assume you all have them--and public utilities commissions to make suggestions regarding the personnel in order that I may be advised as to your wishes in the matter, and consideration will be given to the names received and I will present them to the Secretary of the Interior.

If there are no further discussions on this question, I will ask Mr. Wyer if he has anything else to say.

Mr. Wyer: I would like to summarize one or two features, namely, that if the propaganda work in regard to teaching consumers the correct use of natural gas is vigorously prosecuted, it will result in a great decrease of consumption and in the shortening of the period of low pressure during the winter, and to accomplish that it will require the substitution of properly designed and correctly built new stoves for the old stoves, and I would like to call the stove manufacturers' attention to some very important research work that is now under way at the United States Bureau of Standards. The Bureau has found some very far reaching features regarding burner designs, and this data can be made available in the very near future.

The conclusions that can be drawn now from the observations so far available indicate that the possibilities of increased efficiency in new stove designs have been much underestimated; that is, the possibilities of increased efficiency are very much greater than any of us who have been interested in it could have hoped for. Therefore, every stove manufacturer ought to get in touch with the Bureau of Standards immediately and keep in touch with the experimental work and when the data are available translate that laboratory experience into a commercial device that will very greatly improve the efficiency of utilization and at the same time improve the quality of the service.

As far as putting the whole program of reaching the women across is concerned there are enough agencies available at the present time in the State and Federal governments as far as home economics workers are concerned,

but if the States would properly cooperate with a central agency, like the Bureau of Mines, a comprehensive campaign for teaching women conservation of natural gas and correct use and, therefore, teaching them how to get usable service during the low-pressure period could easily be gotten under way within three or four weeks. It is merely a matter of coordinating and directing and concentrating a large number of activities that are now available and are now generally distributed but could be concentrated on this natural gas conservation question. Therefore, the matter of getting early educational work to the public is one that is entirely possible and entirely feasible and one that, if the committee that has been created or will be created will properly push, definite results can be obtained yet this winter.

Mr. Porter (of New Orleans): Mr. Chairman, the city of New Orleans has been making an investigation of the question of natural gas and the possibility of getting it in the city of New Orleans for a period of nearly a year now and there have been two reports gotten out by the Chief Engineer of the Water Board to the Citizens Committee which the Mayor has appointed. One of those reports was published in August and one was published last week, and there is subject matter in both those reports which I believe would be of value to this convention, and particularly to this committee, on methods of conservation of natural gas, and I would like to have those two reports filed with this Convention, and I would be glad to go over them with anyone who is in charge of that part of it to take out such parts as are of interest to this convention from the reports and make it a special report if thought advisable.

Dr. Manning: Ladies and gentlemen, if there is no more business to be taken up I want to say to you in closing, representing the Secretary of the Interior, that he appreciates, as we all in the Federal service do, your coming here from such long distances to consider this question of conservation.

We have had here in Washington many gatherings of this sort and have listened to reconstruction and readjustment suggestions and little has come from some of them. Now I sincerely hope that when you get back to your homes you will feel that something may come of this and put your best efforts forward to see that something does come of it.

Speaking on behalf of the Interior Department and Secretary Lane, I can assure you that we will do our part, but we can not do it alone. The whole-hearted cooperative effort on the part of you gentlemen and the agencies you represent is necessary to accomplishing anything and it remains to be seen whether or not any constructive policy comes out of this gathering which you people have so generously attended.

I thank you for this opportunity of meeting with you and I hope we will have further meetings.

If there is no further business to attend to we will stand adjourned.

(Whereupon the Convention adjourned).

MEMBERS PRESENT AT NATURAL GAS CONFERENCE

INTERIOR DEPARTMENT

WASHINGTON, D. C.

January 15, 1920.

Adams, Larmour, American Meter Co., Erie, Pa.

Aitchison, Clyde B., Chairman Interstate Commerce Commission, Washington, D.C.

Altizer, R. G., Cabin Creek Gas Co., Charleston, W. Va.

Ashley, George H., State Geologist, Harrisburg, Pa.

Baldwin, Keturah E., American Home Economics Assn., Baltimore, Md.

Barhite, John A., New York Public Service Commission, Albany, N.Y.

Benn, James S., Public Service Commissioner of Penn., Harrisburg, Pa.

Berry, Walter M., Bureau of Standards, Washington, D. C.

Bigelow, Lucius S., Natural Gas & Gasoline Journal, Buffalo, N. Y.

Bigelow, Zella E., Federal Board for Vocational Education, Washington, D.C.

Birdseye, Miriam, Department of Agriculture, Washington, D.C.

Bolger, T. Johnson, Mayor's Gas Committee, Elmira, N. Y.

Bonner, H. G., The Alliance Gas & Power Co., Alliance, Ohio.

Bownocker, J. A., Geological Survey of Ohio, Columbus, Ohio.

Brumbaugh, I. V., Bureau of Standards, Washington, D.C.

Budd, H. L., of Ruud Mfg. Co., Pittsburgh, Pa.

Burlingame, C. E., Wellington Gas Co., Bartlesville, Okla.

Cabot, Godfrey Lowell, Boston, Mass.

Calvin, Mrs. H. W., Home Economic Division, Bureau of Education, Washington, D.C.

Carroll, T. A., Federal Trade Commission, Washington, D.C.

Cartwright, W. G., Columbia Gas & Electric Co., Cincinnati, Ohio.

Colwell, Rachel H., Dept. of Home Economics, Univ. of W.Va., Morgantown, W.Va.

Cooper, H. C., Hope Natural Gas Co., Pittsburgh, Pa.

Cornell, M. C., City Solicitor, Erie, Pa.

Corrin, John B., Reserve Gas Co., Pittsburgh, Pa.

Cross, Raymond, United Natural Gas Co., Oil City, Pa.

Davis, Alfred C., City of Jamestown, New York.

Davis, Ben F., Chief, Oil and Gas Conservation Comm. Oklahoma City, Okla.

Davis, Herbert R., Republic Light Heat & Power Co., Buffalo, N.Y.

Denning, L. B., Ohio Fuel Co., Pittsburgh, Pa.

Denton, Dr. Minna, Dept. of Agriculture, Washington, D.C.

Eagleson, Freeman, T.,Ohio Gas Companies, Columbus, Ohio.

Ehlers, H. E., Public Service Comm. Harrisburgh, Pa.

Elifritz, Olga A., Eastern Oil Co., Buckhannon, W. Va.

Fisher, F. P., Empire Companies, Bartlesville, Okla.

Fisher, Genevieve, Federal Board of Vocational Education, Washington, D.C.

Fogg, Oscar H., Secretary American Gas Association, N.Y.

Frysinger, Grace E., Dept. of Agriculture, Washington, D.C.

Gager, H. A., Natural Gas Company of West Virginia, Salem, Ohio.

Goff, George S. Crystal City Gas Co., Corning, N. Y.

Goodwin, M. L., Dallas News, Washington, D.C.

Gough, H. E., Engineer Elmira Water, Light, & R.R.Co., Elmira, N.Y.

Gregory, T. B., Emlenton, Pa.

Henson, S. E., Henson Low Pressure Burner, Tulsa, Okla.

Hill, F. H., Vice President Elmira Water Light & R.R. Co., Elmira, N.Y.

Hoover, H. J., The Union Gas & Electric Co., Cincinnati, Ohio.

Hoy, Robert W., Elmira Water Light & R.R. Co., Elmira, N.Y.

Huddle, W. J., Consulting Engr., Chicago, Ill.

Jennison, R. D., W. S. Barstow & Co., New York City

Judge, W. J.,National Fuel Gas Co., New York City

Kelly, Frank D., Addison Gas & Power Co., Addison, N.Y.

Kenefick, D. J., Iroquois Natural Gas Co., Buffalo, N.Y.

Kincaid, G. T., City attorney, City of Corry, Corry, Pa.

Kindley, G. F., Pittsburgh Water Heater Co., Pittsburgh, Pa.

Kinkaid, Andrew, Chamber of Commerce, Oklahoma City, Okla.

Krick, K. C., Logan Natural Gas & Fuel Co., Columbus, Ohio.

Lege, Fred M., Jr., Vice President & Gen. Mjr., Loan Star Gas Co., Dallas, Texas

Leland, Edward D., Philadelphia Co., Pittsburgh, Pa.

Lowry, Frank W., Republic Light Heat & Power Co., Buffalo, N.Y.
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McCloy, W. L., Philadelphia Co., Pittsburgh, Pa.

MacDonald, Pearl, Home Economics Extension Service, Penn. State College,
State College, Pa.
McDonald, Donald, H. M. Bylesby & Co., Chicago, Ill.
Louisville Gas & Electric Co., Louisville, Ky.
Standard Gas & Electric Co., Chicago, Ill.
Oklahoma Gas & Electric Co.,
Fort Smith Gas & Electric Co., Fort Smith, Ark.
Southwestern General Gas Co.,
McDowell, J. C., Wichita Natural Gas Co., Pittsburgh, Pa.

McKirdy, J. E., Philadelphia Co., Pittsburgh, Pa.

Maxon, J. H., Central Indiana Gas Co., Muncie, Ind.
Dawes Brothers, Inc., Chicago, Ill.
Southwestern Gas & Electric Co., Shreveport, La.
Southern Counties Gas Co., Los Angeles, Cal.
Moulton, George F., Gas Engineering Section, Bureau of Standards, Washington, D.

Murdock, Victor, Chairman Federal Trade Commission, Washington, D.C.

Murphy, M. H., City of Elmira, N.Y.

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Payne, Christy, East Ohio Gas Co., Cleveland, Ohio.
The Peoples Natural Gas Co., Pittsburgh, Pa.
Porter, J. L., City of New Orleans, New Orleans, La.

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Richardson, Anna E., Home Economic Section Fed.Bd.for Voc.Ed.,Washington, D.C.

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Smith, George Otis,,U.S. Geological Survey, Washington, D.C.

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